FEBRUARY, 1960

Plant Engineering

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The magazine that helps **plant** engineers with their everyday problems

Volume 14, No. 2 Circulation of this issue 81,752

SQUARE D *announces* NORpak

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NORpak is a significant advance in the field of static switching. Like other static systems, **NORpak** performs the functions of machine tool relays, stepping relays, latching relays and timers —all without contacts or motion of any kind. Like other static systems, **NORpak** is ideal for applications where speed is important—where reliability and long life are essential—where conditions make conventional magnetic devices impractical.

But unlike other static switching systems, NORpak offers these important advantages

EASIEST TO APPLY

The transistor NOR unit is the basis of **NORpak.** All logic functions—AND, OR, NOT, MEMORY—can be accomplished with combinations of this single NOR unit.

NORpak is *not* complicated — it's easy to apply to conventional circuits. Units are color-coded for quick identification. Simple DC circuit eliminates worry about phase relationships.

EXTRA DEPENDABILITY

NOR units have been time-tested in computer use for years. They are not subject to wear, will give top performance indefinitely, and provide unfailing circuit fidelity.

SIMPLE TO USE

Optional monitor lights give visual evidence of proper performance. Simple dynamic sequence tester checks individual NOR units in operation.

UNMATCHED SPEED

NORpak provides switching at rates up to 25,000 per second—faster than any other industrial static system.

EXPERT APPLICATION HELP

Field specialists, factory-trained in all aspects of **NORpak** can give you on-the-spot answers to any application questions.

SMALLEST COMMERCIAL PACKAGES

NORpak is available in the form of individual components, or in completely engineered systems. Components are offered in 6 and 20 paks, require only 1/4th the equivalent relay panel space, and weigh less than components of other static systems.

NORpak is available as individual components for application to specific control functions, or as completely engineered systems ranging from the smallest to the largest panels

Write for the complete story on **NORpak** *— its theory, application and operation... Square D Company, 4041 North Richards St., Milwaukee 12, Wisconsin*

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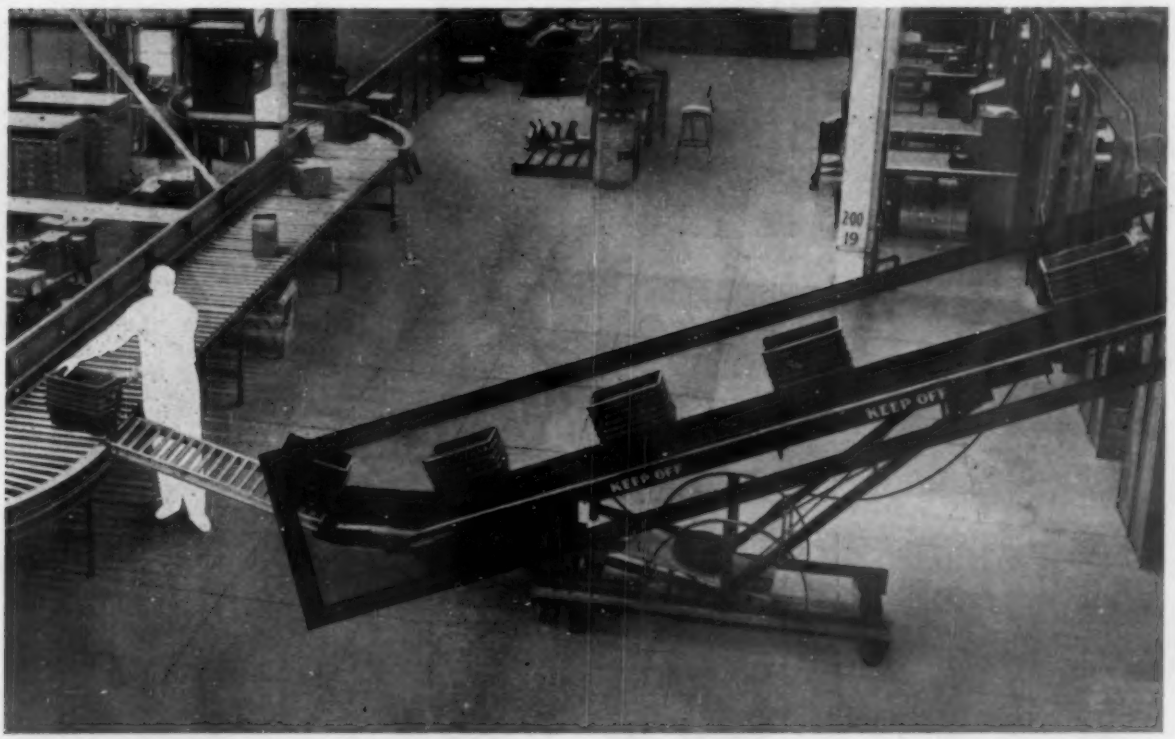
SQUARE D COMPANY

wherever electricity is distributed and controlled

For more facts circle 501 on Reply Card

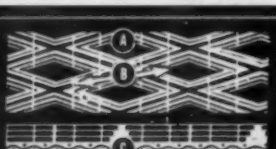
Moving stacks of hefty tote boxes that handle small parts called for conveyorization at this big Eastern plant. But that wouldn't work either – unless they could prevent the slick-surfaced steel boxes from backsliding on inclines over 25°. So the conveyor manufacturer tested various "rough-topped" belts – including the one recommended by the G.T.M. – Goodyear Technical Man. The winner? The G.T.M.'s Wedge-Grip – unequaled for its ability to work on inclines previously considered impossible. Now, in this plant, the slide-prone tote boxes ride up 30° slopes without any backsliding whatsoever. And the belt's self-cleaning, long-wearing cover design will give this user years of trouble-free service.



GOODYEAR INDUSTRIAL PRODUCTS

GTM-Specified

Wedge-Grip Package Conveyor Belting



A Soft, long-wearing cover in stepped-down, diamond-shaped design provides long-lasting, superior gripping of smoothest objects

B Siping – cross-cuts in cover design – improves grip and flexibility

C Cross section of belt showing "step-down" design of gripping ridges and fabric reinforcement

Credit still another rescue, then, to the G.T.M. He makes a habit of coming through with time- and money-saving answers when all else fails.

And he'll answer your SOS, too – if you contact him through your Goodyear Distributor. That's also your source for the standout Hose, V-Belts, Flat Belts and other industrial products. Just look under "Rubber Goods" or "Rubber Products" in the Yellow Pages or write Goodyear, Industrial Products Division, Akron 16, Ohio.

Wedge-Grip – T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Facts About Plastics

AN EDUCATIONAL program, Getting Acquainted with Plastics, is offered by Cadillac Plastic & Chemical Company for in-plant presentation to engineering, research or purchasing personnel.

The program covers properties and applications of the entire range of plastics now available in standard shapes, with emphasis on 11 major thermoplastic families and the fiber glass reinforced plastics.

Program includes 10 minutes of color slides, numerous visual demonstrations, two table top displays covering the dozen best known plastic families plus sample trays of each family for audience manipulation.

For more information about this plastics program, write to Robert B. Jacob, President, Cadillac Plastic & Chemical Company, 15111 Second Avenue, Detroit 3, Michigan.

New Maintenance Superintendent

Albert C. Johnson, master mechanic at Rubbermaid Incorporated, Wooster, Ohio, for the past four years, has been promoted to maintenance superintendent. In his new position, he will be in charge of maintenance of equipment and facilities.

He is a native of Baker, North Dakota, and is a resident of Mt. Eaton. During his Air Force service he attended the Ohio Institute of Aeronautics, the Glen L. Martin school for flight engineers and the Vickers School of Hydraulics.

Ventilation Conference

ALL THE FACETS of industrial ventilation will be discussed at the 9th Annual Industrial Ventilation Conference. It will be held from February 15 to the 18, at the Kellogg Center for Continuing Education, Michigan State University, East Lansing, Michigan.

In addition to papers on such subjects as hood and duct design, the right fan for the job, dust collectors and makeup air, there will be helpful workshop sessions considering specific problems.

For more information about this program or to make your reservation, write to Industrial Ventilation Conference, Continuing Education Service, Michigan State University, East Lansing, Michigan.

Engineering Promotion at Hooker

Raymond S. Briggs, at one time plant engineer, has been named manager of engineering services of the Hooker Chemical Corporation, Niagara Falls, N. Y.

He came to the company in 1933 as a draftsman in the engineering department. In 1940 he was made plant engineer. He held this position for 14 years and was then promoted to assistant chief engineer, the position he held prior to his recent promotion.

A graduate of Carnegie Institute of Technology, he is a member of the New York State Society of Professional Engineers and the Niagara Falls Chapter of the American Institute of Chemical Engineers.

Building Workshop Sessions

PRESENTATION of the results from questionnaires on four building classifications will be a major feature of the Building Operation and Maintenance Study Group of the Building Research Institute. It will be held at the Statler Hilton Hotel, New York City, from April 5 to the 7.

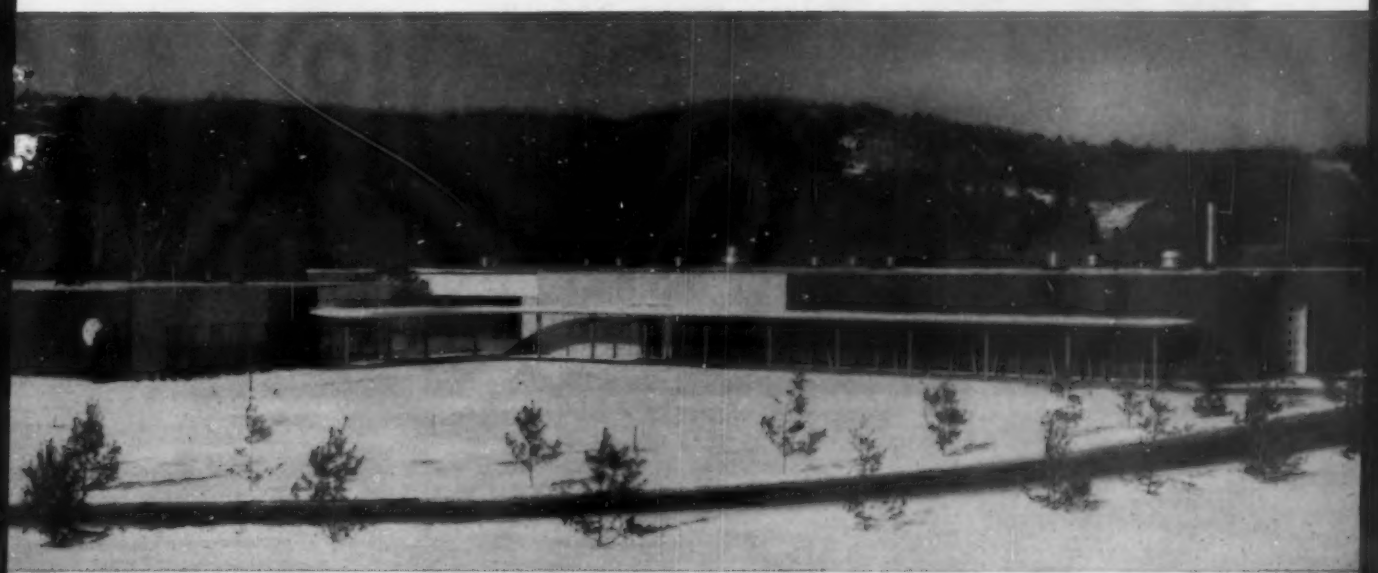
The four building classifications surveyed were: residential, commercial, institutional and industrial. After each report is presented, there will be a panel discussion regarding the results. Panel members will consist of architects, plant engineers, research group representatives, builders, manufacturers and publishers.

Based on the results of this survey, the BRI will enumerate specific items or ideas which are currently needed

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as a controlled circulation publication at Chicago, Ill.

One of the country's "TOP TEN" plants uses distinctive Natco clay brick

Appearance of building and grounds was one of the important selecting factors in the "top ten" competition.



Decorative and durable Natco black velour brick gives the Split Ballbearing plant in Lebanon, N.H., distinctive design. This plant (Division of Miniature Precision Bearings, Inc.) was designed by Carl Koelb & Associates, Architect, Weston, Mass.

Split Ballbearing's new plant in Lebanon, New Hampshire, was recently named one of the "top ten" plants constructed in the United States during 1958. Chosen by Factory Magazine, selection was based on beauty and utility. These qualities were needed in competing against more than 700 entrants.

One of the main considerations was the appearance of the plant exterior. Natco Ceramic Glaze Velour Brick was used on the outside wall construction. Versatile black velour brick serves a dual purpose. First, it is distinct in design . . . modern now *and* in the future. Second, it is durable . . . will help solve outside maintenance problems.

Velour brick is furnished in nine attractive colors, plus black and white. It is available in standard brick sizes and conforms to ASTM specifications. For more information, write for Circular CB-20.

Beauty and utility . . . Natco velour brick has them both

natco corporation

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THOMAS
ALL METAL
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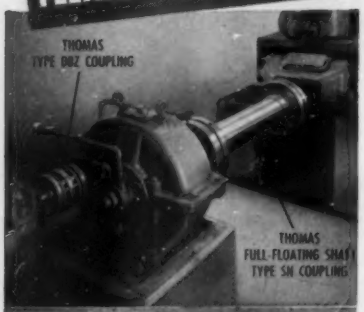

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NO WEARING PARTS

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- No Lubrication
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- No Maintenance

Write for Engineering Catalog

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WARREN, PENNSYLVANIA, U.S.A.

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'ROUND ABOUT

in building materials and methods and direct the information into proper channels for research and improvement.

Other categories included in this program will be on paints, adhesives, and masonry cavity walls, air cleaning and purification in buildings and a plastics information workshop.

If you would like more information about these workshop sessions, write to Harold Horowitz, Building Research Institute, 2101 Constitution Avenue, Washington 25, D. C.

Ball and Roller Bearing Standard

FOR THE FIRST time, an American Standard method of evaluating load ratings for ball and roller bearings has been established, providing a uniform capacity rating system for bearings made by all manufacturers.

The standard establishes uniform test procedures and statistical methods for determining load-carrying capacity and expected fatigue life of both ball and roller bearings. It covers dynamic as well as static capacity of radial and thrust type bearings and contains definitions of bearing life, basic static rating and static equivalent load.

Copies of this standard, B3.11-1959, are available at $1.75 per copy from the American Standards Association, Dept. PR 81, 70 E. 45th St., New York 17, N. Y.

Building Bibliography

MANY READERS will find this booklet which lists a number of publications dealing with equipment in industrial buildings and the servicing and maintenance of same, of interest. The booklet was prepared by the Building Research Advisory Board.

There are approximately 35 different listings in this booklet, covering such items as: Selection and Maintenance of Air Filters; Electrical Load Growth in Buildings; Cooling Towers and Evaporative Condensers; Paints for Structures; and many others.

If you would like a copy of this publications listing, write to Building Research Advisory Board, National Academy of Sciences, National Research Council, 2101 Constitution Ave., Washington 25, D. C.

Classes in Spray Painting Will Reconvene Soon

EMPHASIS WILL be placed on airless and electrostatic spray painting equipment at the spring sessions of the spray painting school. Classes will be held on March 7 to 11, April 4 to 8, May 2 to 6 and June 6 to 10.

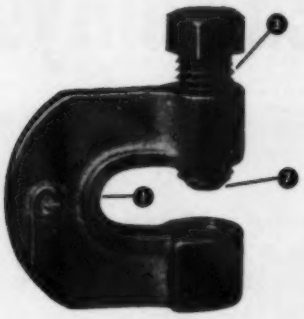
The classes will be conducted at the facilities of Binks Manufacturing Company, Chicago, Illinois.

Instruction is given on all types of spray finishing equipment, including guns, pumps, compressors, spray booths and other related equipment. Tips on how to select the right equipment for the job, plus instructions on the maintenance and care of this equipment will be fully covered.

The school is open to all interested. Enrollment can be arranged by writing to B. J. Hedger, Binks Manufacturing Co., 3114 Carroll Ave., Chicago 12, Illinois.

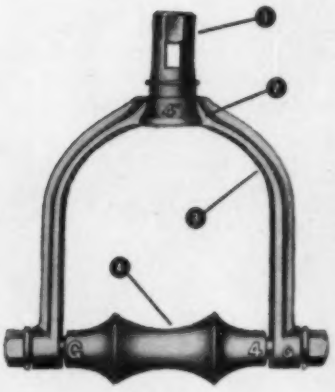
John Adams, instructor of the spray finishing school, explains proper use of just one of the many pieces of equipment which are discussed at the sessions.

Look at all the extras you get in Grinnell Pipe Hangers . . . yet you pay no more!



GRINNELL C-CLAMP, FIG. 88 — 1 Ribbed, malleable iron casting, for extra strength **2** Hardened steel, cup-point set screw for good "grip" on beam **3** Full thread engagement – casting is drilled and tapped for rod and set screw

GRINNELL EXTENSION SPLIT RING, FIG. 138 — 1 Nipple engaging thick section of malleable iron gives rigidity for support from above, below or from wall **2** Tapped to take screw. No nut to lose **3** Special ring contour holds pipe or tubing firmly



GRINNELL ADJUSTABLE SWIVEL PIPE ROLL, FIG. 174 — 1 Swivel shank permits adjustment without elaborate support **2** Locking device prevents accidental adjustment change; no lock nut required **3** Ribbed design in malleable iron for better strength, lightness, appearance **4** Easy installation; maximum adjustment

GRINNELL CB CONCRETE INSERT, FIG. 282 — 1 One body size accommodates several sizes of rods **2** Slot takes reinforcing rods to assure maximum load rating **3** One-piece body prevents concrete seepage **4** Teeth on insert and nut hold rod firmly in place **5** Homogeneous composition of malleable iron throughout

You get *more* hanger for the money from Grinnell, because Grinnell's huge volume reduces production costs . . . lowers prices right into line with competitive hangers offering less.

Yet you get *so much more* . . . wider choice of types and sizes; better quality control; published ratings for *all* hangers; faster delivery from warehouses nationwide; and more responsible field service by trained Grinnell personnel . . . regardless of how far from the job site the sale was made! Grinnell Company, 277 West Exchange St., Providence 1, R. I. Branch Warehouses in Principal Cities.

Remember, The Best Costs No More — from America's #1 Supplier of Pipe Hangers and Supports

Call your local Grinnell Distributor for pipe hangers, cast and malleable iron fittings, malleable unions, steel nipples – all made by GRINNELL

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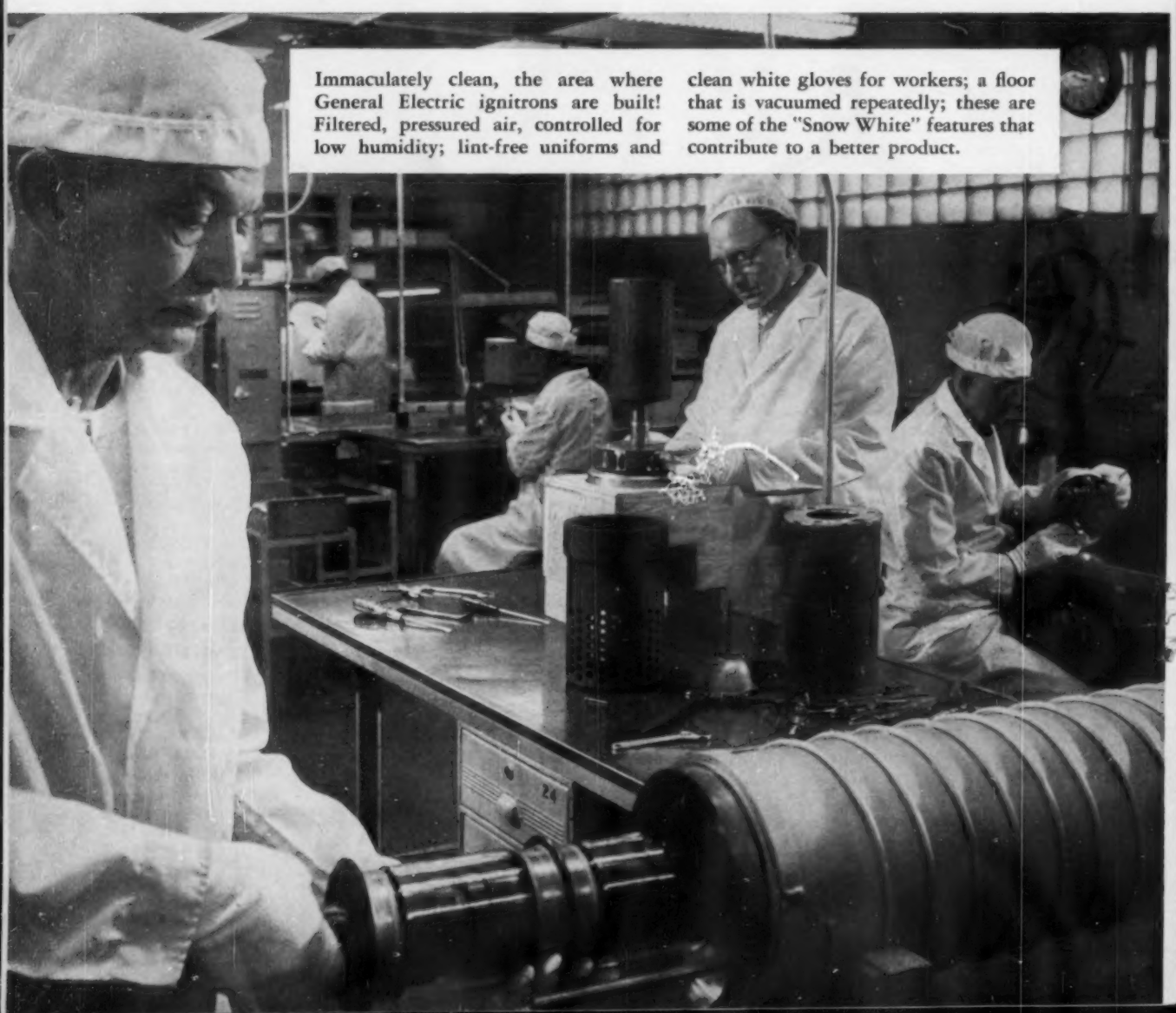
NOW....“Snow White” Manufacture Big Gain in Tube Reliability! Your

Rust-causing moisture; oil and contaminating fumes; dirt particles, lint fibres—all these are threats to reliability in ordinary ignitrons. General Electric's "Snow White" manufacture wards off these hazards. *You* benefit in less downtime incurred by your welder or other equipment that uses G-E ignitrons, made under surgically clean conditions unmatched in the industry. And your maintenance costs drop.

The tiny deposits of rust that work harm inside other metal tubes, will not form in the dry air and spotless surroundings in which G-E ignitrons are assembled. These premium-quality tubes are built for utmost dependability, maximum service life. They keep your production humming. Phone your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*



Immaculately clean, the area where General Electric ignitrons are built! Filtered, pressured air, controlled for low humidity; lint-free uniforms and clean white gloves for workers; a floor that is vacuumed repeatedly; these are some of the "Snow White" features that contribute to a better product.

# of G-E Ignitrons! Output Speeded!

▲ White gloves keep moisture and contamination from parts like this G-E ignitor point which is being micro-inspected. The parts first are baked in hydrogen furnaces to remove all impurities; then are delivered to the inspection and assembly area in sealed plastic bags.

◀ Working in dehumidified air that is free from contaminants, this craftsman wearing Dacron uniform and cap measures the tube grid-anode spacing in hundredths of an inch—one of many careful pre-assembly checks that help make G-E ignitrons the finest you can install.

BEST FOR WELDING . . . and you save on tube inventory! Three popular General Electric ignitrons will replace no less than 44 other welding tubes, as follows:

G-E IGNITRON GL-5551-A REPLACES . . .		G-E IGNITRON GL-5552-A REPLACES . . .		G-E IGNITRON GL-5553-B REPLACES . . .	
NL-1051	5551-A	NL-1052	AX-5552-A	NL-1053	GL-5553-A
NL-1051-A	AX-5551-A	NL-1052-A	AX-5552/651	NL-1053-A	GL-5553/FG-258-A
NL-5551-A	AX-5551/652	NL-5552	WT-210-0072	WL-5553-B	AX-5553-B
WL-5551/652	WT-210-0149	WL-5552/651	WT-210-0157	WL-5553-A	AX-5553/655
WL-652/657	WT-210-0071	WL-651/656	GL-5552/FG-235-A	WL-5553/655	WT-210-0073
WL-5551-A	WT-210-0156	WL-5552-A	5552	WL-655/658	FG-258-A
5551	GL-5551/FG-271	FG-235-A	5552-A	5553	5553-A
	FG-271				5553-B

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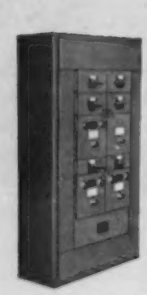
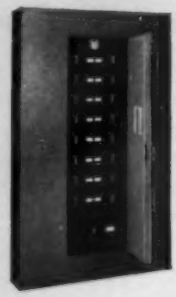
Safety Switches for Normal and Hazardous Locations

Industrial Circuit Breakers for Normal and Hazardous Locations

Load Centers—Circuit Breaker and Fusible

D ...design leadership D ...design l

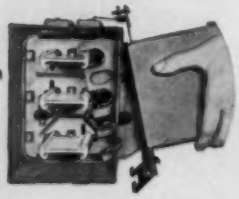




Fusible and Circuit Breaker Lighting and Power Panelboards

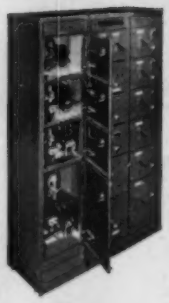
Power Distribution Switchboards and Switchgear

Plug-In Duct

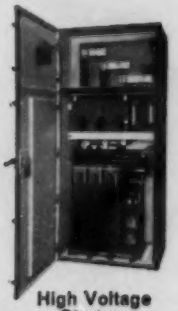


Feed-In Duct

Motor Control Centers



Synchronous Motor Starters



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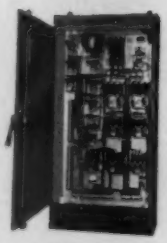

Special-Purpose Control

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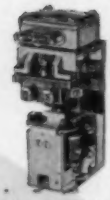
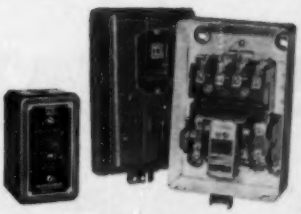
Drum Switches

Control Relays



Timing Relays



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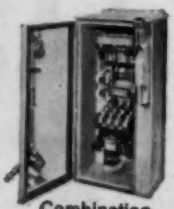
Limit Switches

Push Buttons



Combination Starters

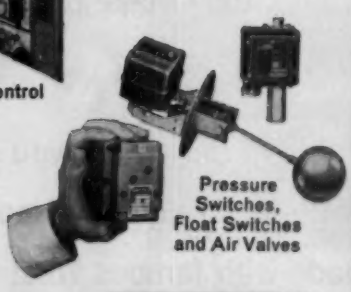
Starters for Hazardous Locations

Reduced Voltage Starters

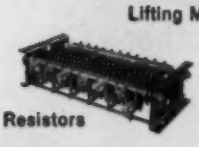
Welder Control

Static Control Components and Systems

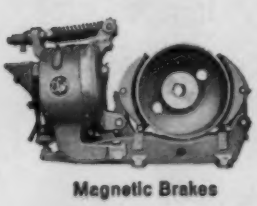
Lifting Magnets



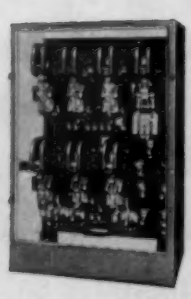
Pressure Switches, Float Switches and Air Valves

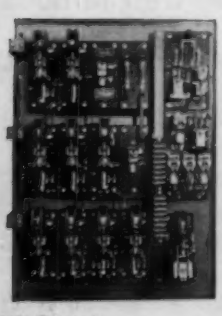


Resistors



Magnetic Brakes





Crane and Mill Control

wherever electricity is distributed and controlled

- ADJUSTABLE SPEED DRIVES
- BUSWAYS & WIREWAYS
- CIRCUIT BREAKERS
- CONTROL CENTERS
- CRANE & HOIST CONTROL
- DISTRIBUTION SWITCHBOARDS
- ELECTRIC TRUCK CONTROL
- HIGH VOLTAGE CONTROL
- LAUNDRY CONTROL
- LIFTING MAGNETS
- LIGHTING AND POWER PANELBOARDS
- LIGHTING CONTROL — LOW VOLTAGE
- LIMIT AND FOOT SWITCHES
- MACHINE TOOL CONTROL
- MAGNETIC BRAKES
- METER MOUNTINGS
- MOTOR STARTERS
- PRESS CONTROL
- PRESSURE, FLOAT, & VACUUM SWITCHES
- PUSHBUTTONS
- RELAYS AND CONTACTORS
- RESISTORS
- SAFETY SWITCHES
- SERVICE ENTRANCE EQUIPMENT
- STAGE DIMMERBOARDS
- STEEL MILL CONTROL
- SWITCHGEAR & UNIT SUBSTATIONS
- SYNCHRONOUS MOTOR CONTROL
- TERMINAL BLOCKS
- TEXTILE MACHINE CONTROL
- TIMERS
- VOLTAGE TESTERS
- WELDER CONTROL

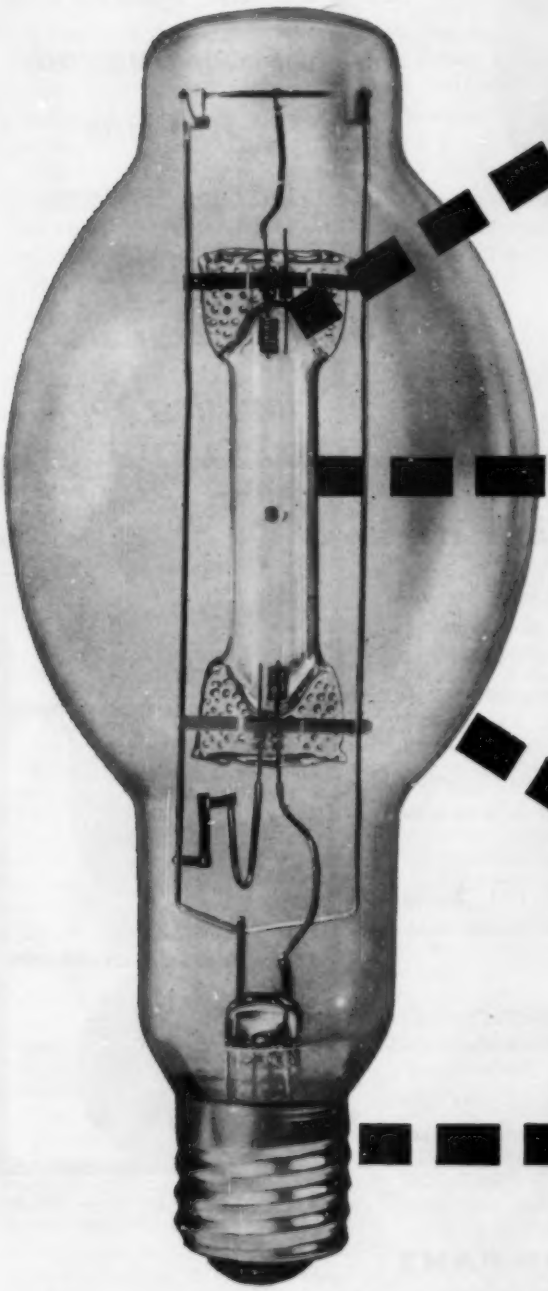
For more facts circle 507 on Reply Card

EXCLUSIVE WEATHER LIFEGUARD™ ARC TUBES YOUR BEST BUY IN MERCURY LAMPS!

By any standard of comparison, new Westinghouse "Lifeguard" mercury lamps are the most economical choice for industrial, street, and parking lot lighting. The exclusive Westinghouse "Lifeguard" arc tubes in these lamps save you money by maintaining high initial light output longer. And, they make possible lower-cost new lighting installations.

In addition to getting more light per dollar, you save on labor and maintenance costs, too, with less frequent lamp changing. And "Lifeguard" lamps are made with famous Westinghouse "Weather Duty" bulb construction for resistance to thermal shock, moisture and all industrial fumes. New Westinghouse "Weather Duty" lamps with "Lifeguard" arc tubes are interchangeable with other types of the same wattage. Make the change today. Contact your authorized Westinghouse lamp agent or nearest Westinghouse sales office.

DUTY™ LAMPS WITH MAKE WESTINGHOUSE



New design electrodes with specially-compounded and locked-in emission material virtually eliminate light-robbing arc tube blackening.

"Lifeguard" arc tube improves lumen maintenance... 85 percent of initial light output after 10,000 hours.

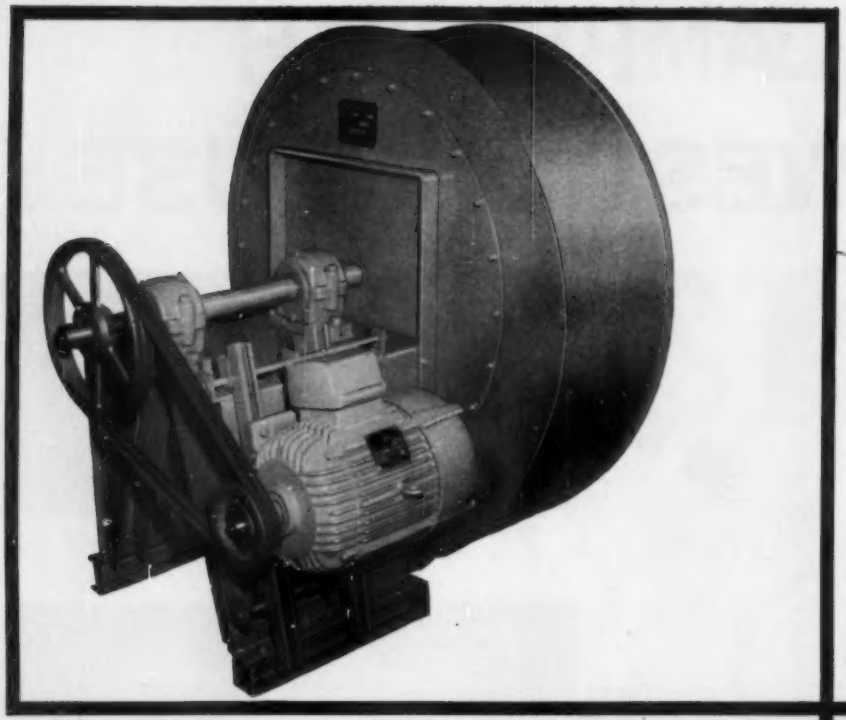
First with "Weather Duty" lamps... fume-proof and moisture-proof, shock-resistant glass.

Permanent-grip silicone cement holds bases tight for the life of the lamp. Remains strong at high temperatures. No strain on glass.

YOU CAN BE SURE... IF IT'S Westinghouse

Westinghouse Lamp Division · Bloomfield, N. J.

For more facts circle 508 on Reply Card



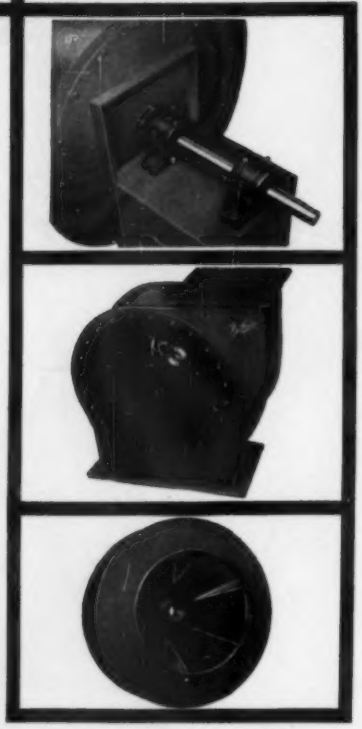
From Rugged Hot Gas Applications To Tough Materials Handling Jobs...

"BUFFALO" EXHAUSTERS CAN TAKE IT!

"Buffalo" Industrial Exhausters are ruggedly built, highly efficient heavy duty fans designed for a wide variety of applications. Husky steel plate housing is welded throughout. Adjustable to any discharge direction. Reversible for clockwise or counter-clockwise rotation. Available in numerous arrangements for many severe air and materials moving jobs. These include:

- **Moving Hot Gases** — 200° F. to 850° F. For this purpose units are equipped with heat slingers, high temperature ball bearings and/or separated steel bearing subbase.
- **Handling Corrosive Fumes.** Installations have proved that "Buffalo" Rubber-Lined Exhausters will outlast metal fans up to twelve to one. Rubber is vulcanized directly to all metal parts exposed to acid fumes.
- **Materials Moving.** Type "MW" material wheels are available for moving emery dust, saw dust, chips, long shavings and many other types of materials.

Investigate the advantages of "Buffalo" Industrial Exhausters for your severe air or materials moving jobs. Phone your "Buffalo" engineering representative, or write for Bulletin FI-110.



Upper: Heat Slinger for cooling shaft and bearings on a "Buffalo" Hot Gas Exhauster.

Center: "Buffalo" Rubber-Lined Exhauster for corrosive fume handling.

Lower: "Buffalo" Type "MW" Material Wheel.

BUFFALO FORGE COMPANY
Buffalo, N. Y.

Buffalo Pumps Division • Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING EXHAUSTING AIR CLEANING FORCED DRAFT AIR TEMPERING COOLING HEATING INDUCED DRAFT PRESSURE BLOWING

For more facts circle 509 on Reply Card

Hall Industrial Water Report

VOLUME 8 FEBRUARY 1960 NUMBER 1

Don't Carry Things Too Far

This familiar expression predicts trouble. Just as trouble with deposits comes when steam carries droplets of boiler water too far—out of the boiler steam drum into superheaters, turbines, heat exchangers and heating systems. Superheater tubes burn out, turbines lose efficiency and capacity, and heat transfer suffers.

Hall engineers know how to combat carryover problems. They are familiar with the mechanical methods of purifying steam and know how to determine whether antifoams are also needed. They can help you to improve steam quality just as they can serve you on other water problems in the steam plant, or in cooling process or waste water disposal facilities.

Spreading Oil on the Water

At a southern synthetic fiber mill serious fouling of a turbine with water-soluble deposits required washing at intervals of approximately three months. This puzzled Hall engineer T. A. McConomy no end because normally his checks on steam showed it to be of good quality. Furthermore, he could find no place in the mill where the condensate, makeup water or boiler feedwater was being contaminated. The use of antifoams in the boiler water did not improve conditions.

One day heavy carryover occurred —so heavy that steam temperature temporarily dropped almost 100°F. The alert operators collected samples of boiler water. Analysis showed one to contain 28 ppm of ether-extractable material and the other an astounding 1185 ppm. Infrared analysis showed the ether-soluble material to be largely lubricating oil.

What was the source of the oil? Previous investigation had ruled out the mill. McConomy asked the operators to keep a careful watch on the river water at the plant intake. A few days later an oil slick showed up.

It was now easy to trace the source of contamination upstream to several service stations and small manufacturing plants which were dumping oil into the river. The job of getting them to stop was harder. So the filter plant operator now has an extra duty called "river watching." This makes possible the diversion of oil-contaminated water from the steam plant, and saves the cost of additional, expensive equipment.

Baffling Leaks

Carryover was so bad in a midwestern automobile body plant that steam traps were continually plugging and a turbine-driven air compressor couldn't produce at rated capacity. It was determined that one boiler of three was causing all of the trouble.

Each boiler was put through its paces while steam quality was checked conductometrically by Hall engineer L. P. Dougherty. Steam from two of the boilers was found to be excellent under all conditions, even when operated at ratings well above normal. The third boiler acted all right until the rating was pushed a little above normal, then gobs of water went out in the steam.

Having proved which boiler was the bad actor, Dougherty asked that it be taken out of service for inspection of steam drum internals. Sure enough, the baffles were found to be hanging loosely, leaving spaces where steam could short-circuit to the offtakes without following the designed path.

Baffles were tightened and the leaks closed up. Additional steam purity checks showed that the repairs were effective. Trouble stopped and has not recurred.

Embrittlement in Steam Line

Failure of steam lines due to caustic embrittlement is almost unheard of. It can occur, however, if the necessary conditions are present. Caustic soda must get into superheated steam to produce a concentrated solution and this solution must contact highly stressed metal.

In one case high-pressure steam was reduced to 60 psi and desuperheated to within 40°F of saturation temperature. Desuperheating water was a mixture of condensate and deionized water. The pH value of the deionized water was adjusted to 9.0-10.0 with caustic soda for protecting uncoated steel pipe from corrosion and for establishing desired alkalinity in the boiler water.

The steam line was welded. Chill rings had been used and there were open spaces between the rings and the internal surface of the line. When desuperheating water was trapped in the spaces, it concentrated to produce a strong caustic solution in contact with the stressed metal in the welds. Cracking and failure occurred.

In this instance the major source of caustic soda was that added to the deionized water. However, sodium leakage or insufficient rinsing after anion exchanger regeneration could supply the caustic soda. Obviously then, deionizers must be operated with this in mind if the water is to be used for desuperheating.

Water is your industry's most important raw material. Use it wisely.

Industrial Water Problems Require Special Handling

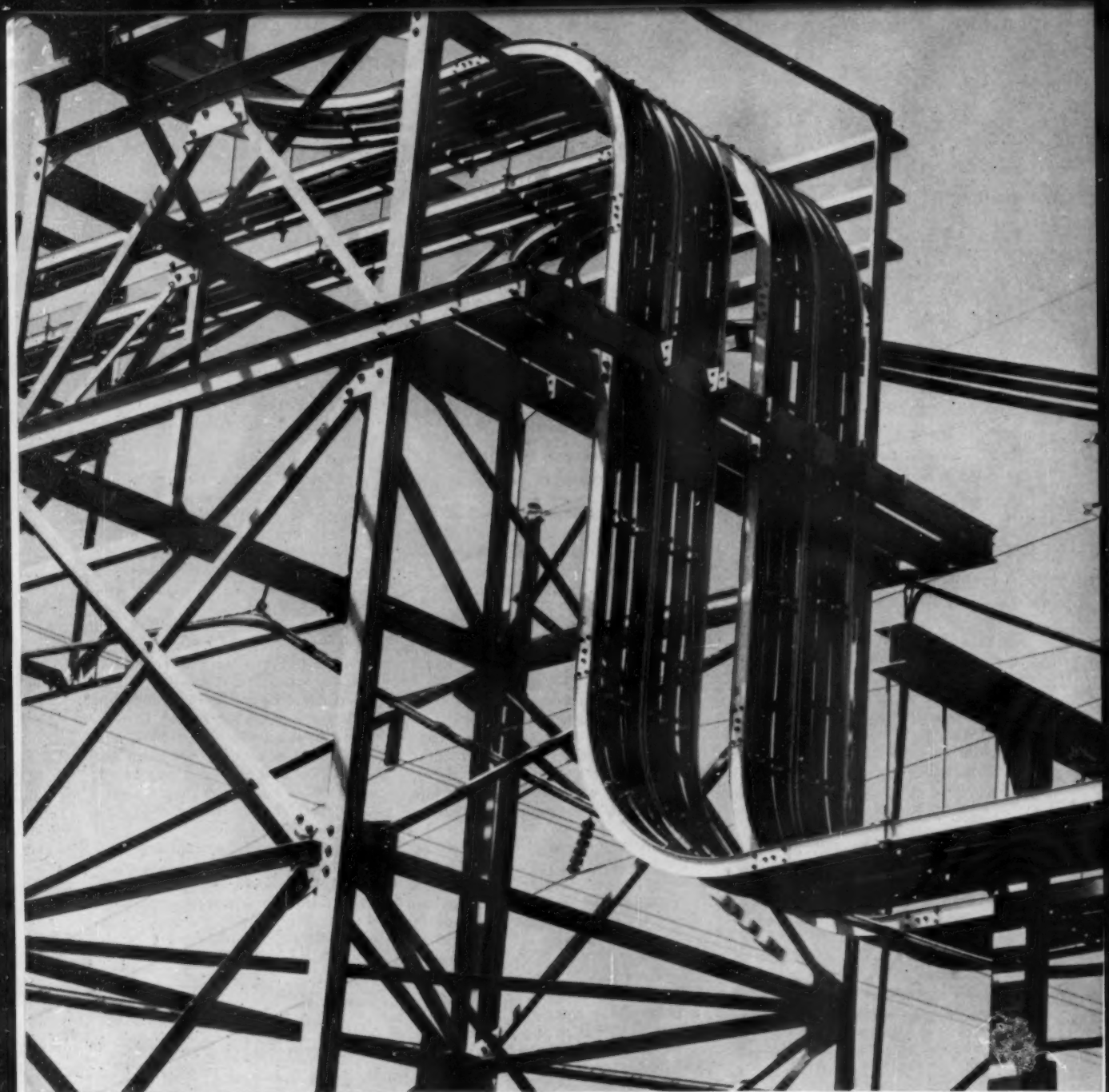
There are no "stock answers" to industrial water problems. For information on how the Hall System can help you solve your particular water problems, write, wire or call address below.

HALL LABORATORIES
HAGAN BUILDING, PITTSBURGH 30, PA.
Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC

Hall Laboratories—Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

For more facts circle 510 on Reply Card



Indoors or out, rugged Anaconda Duralox means fast, easy installation because it needs no rigid conduit. Its reliable Anaconda Butyl (AB) rubber insulation

PROBLEM:

Installing high-voltage cable without rigid conduit

SOLUTION:

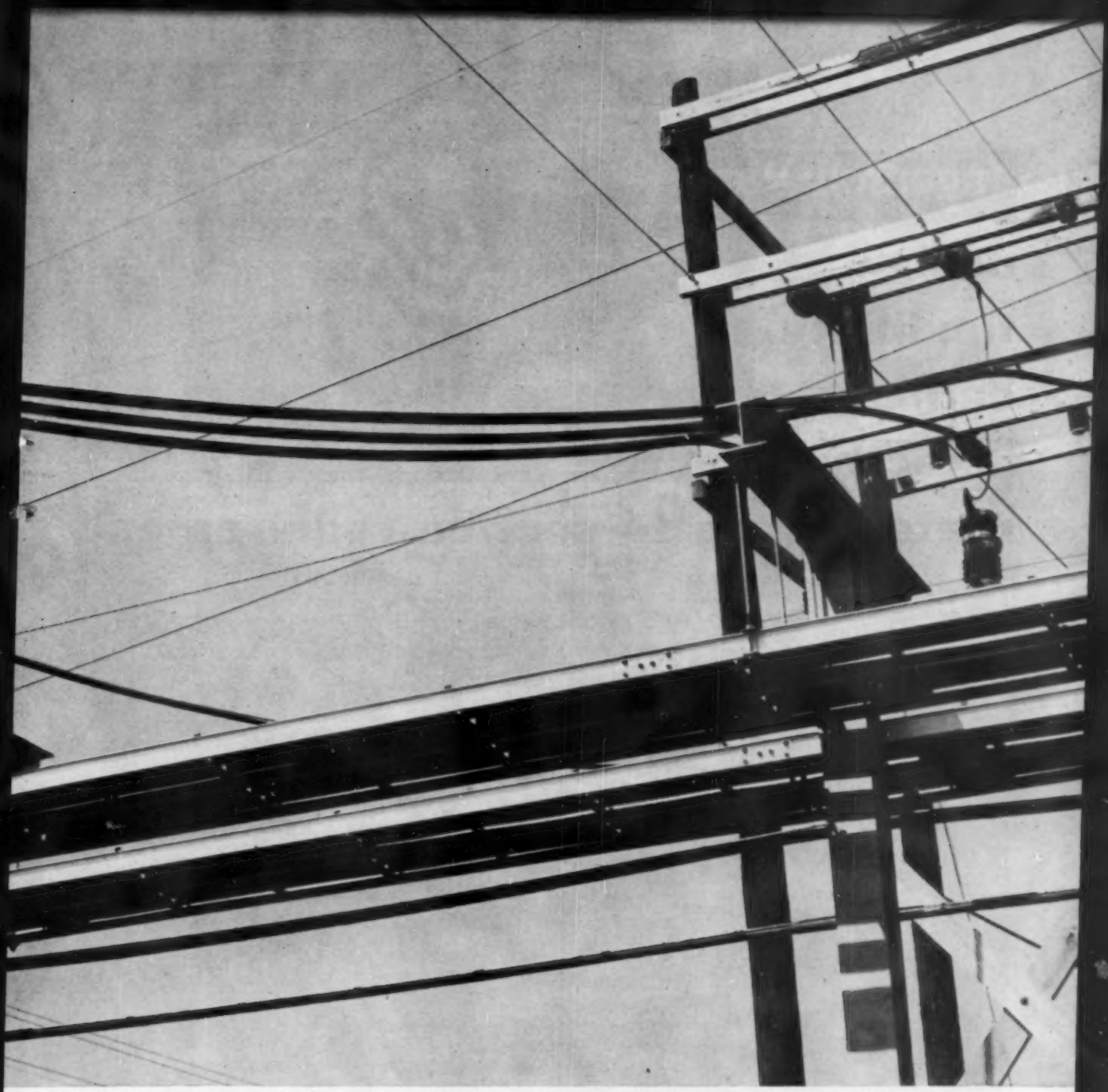
Use Duralox, Anaconda Butyl (AB)-insulated interlocked-armored cable.

You save time . . . you save money . . . you save manpower —with Anaconda butyl-insulated Duralox.* For Duralox has its own conduit of durable, yet flexible, metallic armor.

This means fast and easy installation in long runs over and around obstructions, in trays, indoors or out—and all without the expense, trouble and time of laying rigid conduit and pulling cable through it.

Duralox will fit into your long-range plans as well—because it's 100% salvageable and can be readily moved as your plant layout changes.

Duralox's lower reactance—because of the close spacing of the conductors—results in reduced voltage drop



offers extra protection against ozone and moisture. Above is an installation of Duralox with thermoplastic protective jacket over interlocked armor.

and more efficient power distribution. Available in ratings of 5 kv, 15 kv, and higher, in addition to lower voltage ratings.

Whether your problem is wiring a new plant or rewiring an old one—see the Man from Anaconda. Duralox is just one of the many types of Anaconda wire and cable that can help you increase plant flexibility . . . reduce operating costs . . . bring in new power for your needs today and tomorrow. For full information on Anaconda Duralox Cable write for Bulletin DM-5606 to: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

DURALOX HAS ANACONDA BUTYL (AB) RUBBER INSULATION FOR

- extra-high resistance against ozone
- exceptional moisture resistance
- 22% more current-carrying capacity than 70° centigrade insulation

SEE THE MAN FROM

ANACONDA®

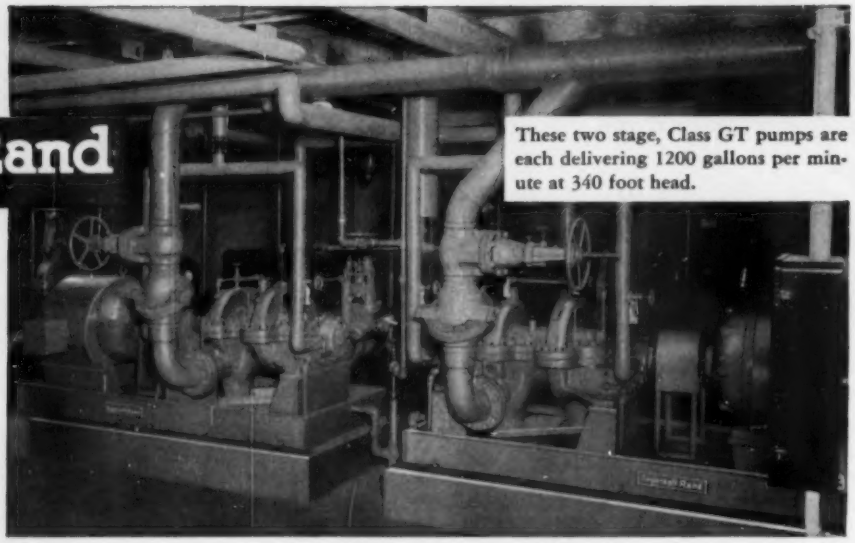
FOR BUTYL-INSULATED
DURALOX POWER CABLE

*Reg. U. S. Pat. Off. 52207

For more facts circle 511 on Reply Card

Ingersoll-Rand

design flexibility can exactly match pump to service requirement



These two stage, Class GT pumps are each delivering 1200 gallons per minute at 340 foot head.

Ingersoll-Rand horizontally split, two stage centrifugal pumps are built for long life and designed for a wide variety of applications. These dependable, 24 hour-a-day duty pumps suit any installation requiring large volume deliveries at high heads.

They are available with single or double suction impellers and can be furnished in special materials to suit unusual conditions. They're ideal pumps for power plants, paper mills, mines, breweries, canneries, packing plants, refineries, iron and steel mills and general industrial service.

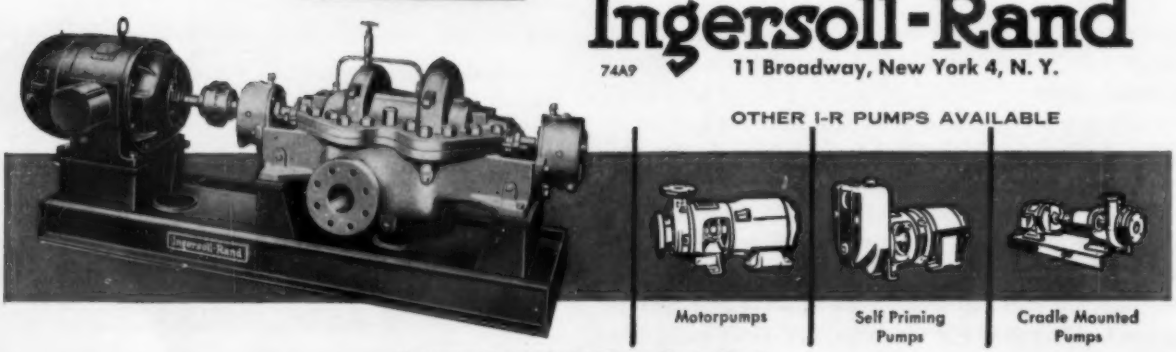
Get the full story from an experienced I-R pump engineer. He can tell you all about these pumps available in 2 to 6 inch discharge size for deliveries to 2000 gpm . . . heads to 1100 ft . . . horsepowers to 400.

a century 1860 – 1960 *of pump progress*

from the leading manufacturer . . .

Ingersoll-Rand

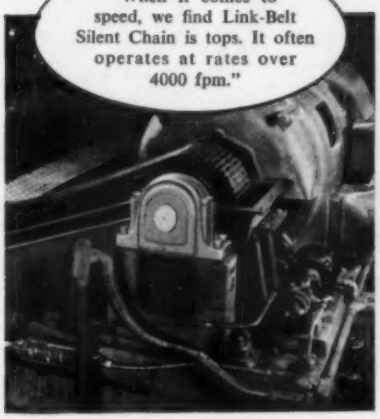
74A9 11 Broadway, New York 4, N. Y.



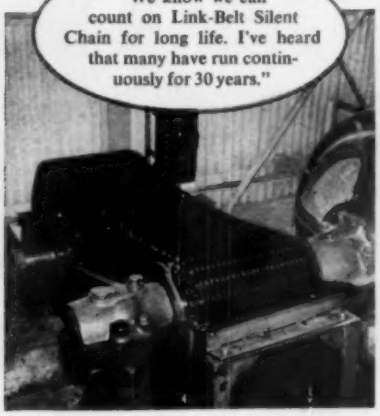
For more facts circle 512 on Reply Card

"Join me on a plant tour . . . see why

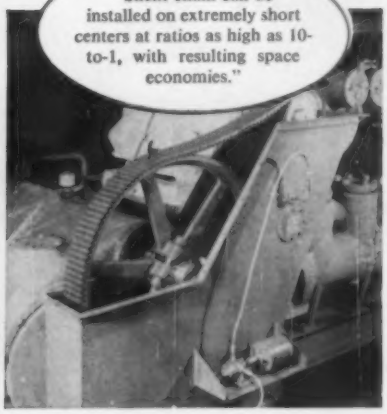
we're modernizing our drives with Link-Belt Silent Chain"



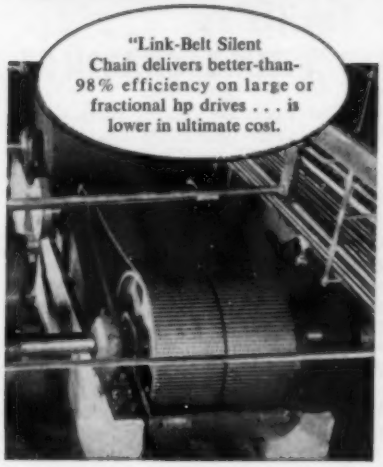
"When it comes to speed, we find Link-Belt Silent Chain is tops. It often operates at rates over 4000 fpm."



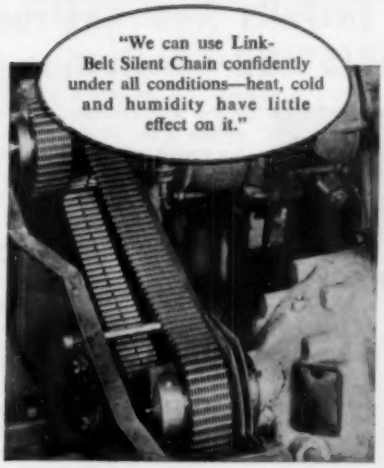
"We know we can count on Link-Belt Silent Chain for long life. I've heard that many have run continuously for 30 years."



"Silent chain can be installed on extremely short centers at ratios as high as 10-to-1, with resulting space economies."



"Link-Belt Silent Chain delivers better-than-98% efficiency on large or fractional hp drives . . . is lower in ultimate cost.



"We can use Link-Belt Silent Chain confidently under all conditions—heat, cold and humidity have little effect on it."

"In close quarters, Link-Belt Silent Chain is ideal. It's easy to assemble . . . permits built-in drives, compact housings."

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

FULL DETAILS on Link-Belt Silent Chain are offered in 88-page Book 2425. Get your copy from your Link-Belt office or authorized stock-carrying distributor. Look under CHAINS in the yellow pages of your phone book.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in [Al Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs, Representatives Throughout the World.

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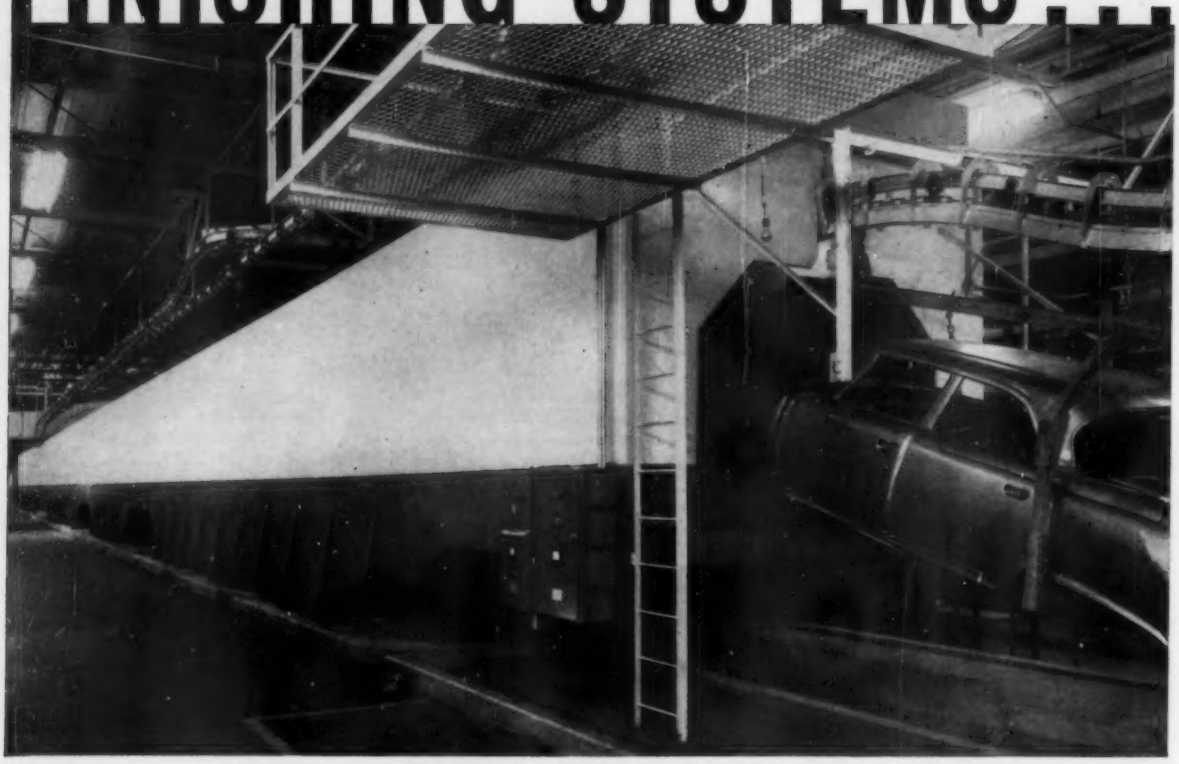
FINISHING SYSTEMS...



Mahon Six-Stage Combined Dip and Spray Cleaning, Rust Proofing and Surface Preparation Machine.

CHRYSLER of CANADA Installs New Antirust Facilities for BODY FINISHING—Including DIP PRIME COATING!

Primer Dip Tank—9000 Gallons of Water-Reducible, Rust-Inhibiting Primer. Bodies are Immersed to a Depth of 18" and are Soaked in this Rust-Proofing Primer for One Minute and Thirty Seconds.

In the new, conveyorized anticorrosion equipment recently installed by Mahon in the Windsor Plant of Chrysler Corporation of Canada, Limited, the bodies pass through seven operations of Cleaning, Rust Proofing and Dip Prime Coating.

In the first six operations of cleaning and surface preparation, which include a phosphate coating and chromic acid bath, the bodies are subjected to high intensity impinging sprays while immersed to a depth of 18" in the same chemical solutions maintained at prescribed level in long tanks. In the seventh operation the bodies are dipped to a depth of 18" into a 9000 gallon tank of water-reducible, rust-inhibiting primer—bodies soak in this armour-like rustproof primer for one minute and a half to ensure effective coating of all the metal surfaces which would otherwise be inaccessible in the complex configurations of unitized body construction.

When you consider buying a new finishing system, or any unit of finishing or processing equipment, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering which plays such an important role in the ultimate operating efficiency of specially designed equipment of this type.

See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-660

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York, Chicago, Los Angeles and San Francisco

. . . the **EXPERIENCE** that goes into the **PLANNING** and **ENGINEERING** of **MAHON EQUIPMENT** is the item of **GREATEST VALUE to YOU!**

MAHON

For more facts circle 514 on Reply Card

BULLETINS just released and of immediate plant interest

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on pages 237 and 238.

CONSTRUCTION AND MAINTENANCE

101 For Roof, Wall Construction—Included in this literature file are product bulletins describing roof and wall construction materials. Bulletin 59C covers corrugated sheets; 59W, insulated walls and metal panels; 595, insulated sandwich curtain walls and roofs; Bulletin 60D, steel and aluminum roof deck; Bulletin 60F, high-strength permanent steel forms for concrete roof and floor slabs; and Bulletin 60R, conveyor hoods and curved corrugated sheets. Elwin G. Smith & Co., Inc.

102 Rolling Doors, Partitions—Illustrated and described in 20-pp Catalog 6001 is a line of rolling doors and partitions, including fire doors, steel and aluminum rolling grilles, extruded aluminum counter doors, and wood side-coiling partitions. Complete information, architectural specifications and detail drawings covering all types of situations are included. The Cookson Co.

103 Aluminum for Architecture—Comprehensive information on aluminum alloys and surface finishes for many applications is provided in this 20-pp booklet. Contains guides to mechanical finishes, as well as descriptions of textures, bright or satin surfaces. Electrochemical and chemical finishes with recommended coatings for varying architectural exposures are listed. A section on applied finishes covers porcelain enamel, baked enamel and primers. Charts list alloys available and show mechanical properties of architectural alloys. Also provided are recommended protective measures against electrolytic corrosion maintenance. Metals Div., Olin Mathieson Chemical Corp.

104 Joining Aluminum Parts—The question. "What are the best ways to mechanically join aluminum parts?" And others about mechanical fastening methods for aluminum are answered in this 32-pp technical handbook. Covers nails and pins, metal stitching, mechanically formed joints and architectural fasteners. Reynolds Metals Co.

105 Metal Lath Specifications—This 20-pp bulletin contains specifications for metal lathing and furring. Fire-resistive ratings, design tables, and specifications for hollow partitions, solid partitions, sound insulating partitions, ceilings, vertical furring and centering are included. Metal Lath Manufacturers Ass'n.

106 Flooring Materials—Resilient flooring, including vinyl Corlon, linoleum, vinyl tile, rubber tile, cork tile, vinyl-asbestos tile and others, available in a variety of patterns, is illustrated in full-color in this 24-pp booklet. Comparative data, basic guide specifications, and other data are included. Armstrong Cork Co.

107 Corrosion-Proof Flooring—Bulletin 120-A describes a monolithic corrosion-proof flooring material developed for application over concrete to protect against acids, alkalis and solvents. Specifications are included, as well as instructions for mixing and applying. The Ceilcote Co., Inc.

108 Floor Coating Systems—Chart 10 for protective coating systems shows, by columns, the resistance of each system to chemicals, thermal shock, abrasion and temperature. It also gives compressive strength, impact resistance, skid proof properties, thickness and cost per square foot. Carboline Co.

109 Painting Economy—This 12-pp guide to economical maintenance painting is designed to help reduce cost of painting in industrial, institutional and commercial buildings. Outlines three basic areas of painting economy. Barreled Sunlight Paint Co.

110 Masonry Treatments—Waterproofing, protective and corrective treatments for masonary are described in 20-pp Circular 17. A variety of applications are illustrated, and suggested specifications are given. Standard Dry Wall Products, Inc.

DUST CONTROL

111 Dust Collector—Bulletin 10-26-59 describes a dust collector with cyclone tubes mounted between the inlet and discharge tube sheets making possible an unobstructed inlet plenum, preventing material buildup and plugging. Advantages are listed, and dimensional data tabulated. Dustex Corp.

112 Electronic Air Cleaner—Twelve-pp Bulletin 405 describes features and advantages of an electronic air cleaner based on the principle of electrostatic precipitation. Diagrams, photos and specifications are included. Dollinger Corp.

113 Unit Air Filters—Construction and application of permanent washable unit air filters is fully detailed in 12-pp Bulletin 207. Covers filter maintenance methods and equipment, installation data, and includes charts, arrestance-resistance curves, engineering data, dimension drawings. American Air Filter Co., Inc.

VALVES, PIPING, FITTINGS

114 Butterfly Valves—Iron body, rubber seated butterfly valves and operators are featured in 36-pp Bulletin 5904. Contains complete information on the valves, designed for hydrostatic operating pressures up to 125 psi and velocities up to 16 ft. per sec., including data on construction and design, dimensions, general hydraulic data, materials and operation. Darling Valve & Mfg. Co.

115 Air Directional Valve—Detailed information on a line of air directional valves designed for a variety of installations is presented in this 16-pp bulletin. Includes dimensions, capacity, weight and other data, as well as diagrammatic views. Industrial products Div., Westinghouse Air Brake Co.

116 Filtration Plant Valves—Filter drain valves, backwash valves and rewash valves for filtration plants are illustrated and described in 8-pp Bulletin W-18. Features are shown on cutaway diagram, and installation details and dimensional data included. Golden-Anderson Valve Specialty Co.

117 Control Valve—Described in Bulletin WC-122 is a single control valve designed to perform the functions of a nest of valves controlling the flow of liquid in zeolite softeners, ion exchange units and filters. Design and operating features are detailed. Graver Water Conditioning Co.

118 Nylon Disc Gate Valve—Bulletin NP-76E describes features and advantages of company's nylon disc gate valve which offers resistance to a wide range of chemicals. Engineering data and specifications are also given. OPW-Jordan.

119 Compact Valves—Specifications and performance information on Trim Line valves designed for controlling small cylinders or operating diaphragms, pilot cylinders where mounting space is extremely limited are presented in 12-pp Bulletin 592. Illustrations of each of six actions included. Hunt Valve Co.

120 Ductile Iron Regulators—Described in this product bulletin are sliding gate ductile iron regulators and control valves. Properties of ductile iron, specifications and test results are covered. OPW-Jordan.

121 Valves and Fittings—Twenty-pp Catalog R-7 contains detailed information on line valves, globe valves, relief valves, heat exchangers, check valves, SAE flare fittings and related brass products. Covers sizing and application of valves and components, with added data on working pressures and descriptions of codes and regulations to which products are manufactured. Superior Valve & Fittings Co.

122 Plastic Pipe—Pertinent and detailed information on PVC plastic pipe, fittings and valves is presented in this 36-pp handbook. Specification, design and installation data is included, as well as a comprehensive corrosion resistance comparison chart of seven types of plastic pipe carrying 162 chemicals. Other charts show maximum operating pressures. Kraloy Plastic Pipe Co., Inc.

BULLETINS

(Begins on page 19)

123 **Plastic Pipe**—Sixteen-pp Technical Bulletin CE-80 describes characteristics and advantages of a general purpose rigid plastic pipe designed for processing, utilities and general industrial use. Chemical resistance tables and other technical data are included. American Hard Rubber Co., Div. Amerace Corp.

124 **Swing Joints**—Catalog F-8 contains 12-pp of design and engineering data on company's swing joints designed for a wide range of applications. Detailed specifications and dimensions included. Jordan Corp.

125 **Hose, Fittings, Couplings**—Industrial Catalog 204, about 40-pp, contains information on hose, fittings, self sealing couplings and related products. Provides up-to-date specifications on products for general industrial applications, power plants, others. A hose selector chart is included, listing applications and fluids for which specific hose types are recommended. Instructions for ordering and assembling hose lines are also given. Arranged for easy selection, book is well indexed, generously illustrated. Aeroquip Corp.

126 **Pipe Alignment Guide**—This bulletin introduces the Align-O Guide, for guiding of pipe lines which are expanding or contracting because of temperature changes. Explains how unit permits movement of pipe in an axial direction only. Discusses necessity for pipe alignment guides, benefits afforded by Align-O Guides, and tells how to use them. The Align-O Pipe Guide Co.

MATERIALS HANDLING

127 **Conveyor Chains**—This 38-pp engineering reference book contains comprehensive information on selection of chain for conveying and elevating. Correct application of chains to conveyor systems, development of attachments to increase their versatility and factors in selecting chains are outlined and illustrated; and comparison tables, installation tips, maintenance pointers and a trouble shooting chart included. Moline Malleable Iron Co.

128 **Industrial Trailers**—Eight-pp Catalog B describes industrail trailers designed for a wide range of materials handling services. Advantages of design and economy, such as low initial cost, low operating cost and low maintenance are stressed. Easton Car & Construction Co.

129 **For Bulk Handling**—Reprint 1-60 discusses in detail the use of company's sealed bins as shipping containers, storage hoppers, and discharge hoppers in conjunction with an automated handling system, Photos of typical applications are included. Tote System, Inc.

PUMPS, PUMPING

131 **Free-Piston Pump**—Features and advantages of an air-operated free-piston pump designed to pump anything that flows are detailed in this product bulletin. Sequence diagrams showing operation are included. The Crossley Machine Co.

132 **Canned Pumps**—Bulletin 1080 describes a line of two-stage, high-head leak-proof "canned" pumps for heads up to 600 ft. Included are general specifications, performance curves and dimensions. Chempump Div., Fostoria Corp.

133 **High-Vacuum Pump**—Application of vacuum technology in a variety of fields is detailed in 16-pp Bulletin 8-20. Design and operation of company's high vacuum pump are described, and cross-sectional views, operating diagram, table of operating characteristics, speed curves and dimensional data and diagrams included. Consolidated Vacuum Corp.

134 **Metering Pump**—Bulletin 1153-C describes design features and operation of company's controlled volume metering pump with submerged liquid end. Detailed specifications and a capacity-pressure selection table included. Milton Roy Co.

135 **Condensation Pumps**—Twelve-pp Bulletin CP-600 illustrates and describes six basic condensation pumps designed for a variety of application requirements. Covers design features, general specifications, engineering data, dimension drawings, construction and operation details. American Air Filter Co., Inc.

INSULATION

136 **Thermal Insulation**—Technical Bulletin I-10 gives data on heat-shield thermal insulation for metal buildings, masonary buildings and industrial equipment. Also includes coefficients of heat transmission for walls and roofs of various types of construction. Columbia Acoustics & Fireproofing Co.

137 **Insulation Materials**—Illustrated with both product and application pictures, and containing price information, 36-pp Catalog 34 presents electrical insulations for repair and maintenance of motors, generators, and electrical or electronic equipment. Covers packaged insulation products such as cuffed paper, formed fibre wedges, Mylar formed wedges, and hard maple wedges; cotton, asbestos, and woven glass tapes; cotton, glass and varnished or saturated tubing and sleeving; Mica plates and laminates; varnishes fabrics; insulation papers; others. Insulation Manufacturers Corp.

138 **Thermal Insulation**—Described in 54-pp Catalog IN-244A are thermal insulations for all types of commercial and industrial requirements ranging from -400 to 3000 F. Contains six sections, each devoted to a specialized group of thermal insulations, including industrial and high temperature; plumbing, heating and air conditioning; refrigeration, insulating firebrick and refractories; finishes and weather-proofing materials; also asbestos papers, millboard, felts. Johns-Manville.

MECHANICAL POWER TRANSMISSION

139 **Motor Reducers**—Construction and mechanical features of motor reducers for use with blowers, compressors, conveyors, cranes, hoists, elevators, machine tools, rotary mills, mixers and stokers in a variety of industries are detailed in 30-pp Catalog MR-58. Load characteristics are outlined, including horsepower and torque ratings, overhung loads and maximum allowable thrust loads. Philadelphia Gear Corp.

140 **Variable-Speed Sheave**—Bulletin 6102, 8-pp, describes the stationary control SVS variable-speed sheave for V-belts available with two, three of four grooves. Features of this positive-locking sheave are: non-freezing non-lubricating construction, method of installation, and speed change. T. B. Wood's Sons Co.

141 **Spherical Roller Bearings**—High capacity spherical roller bearings are described in detail in 52-pp Book 2760. Illustrated with numerous photos, drawings and diagrams, it includes comprehensive selection data and formulae, shaft bearing seat diameters, lubrication information, shaft details and bearing load ratings, diagrams, and charts. Link-Belt Co.

On pages 237-238 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

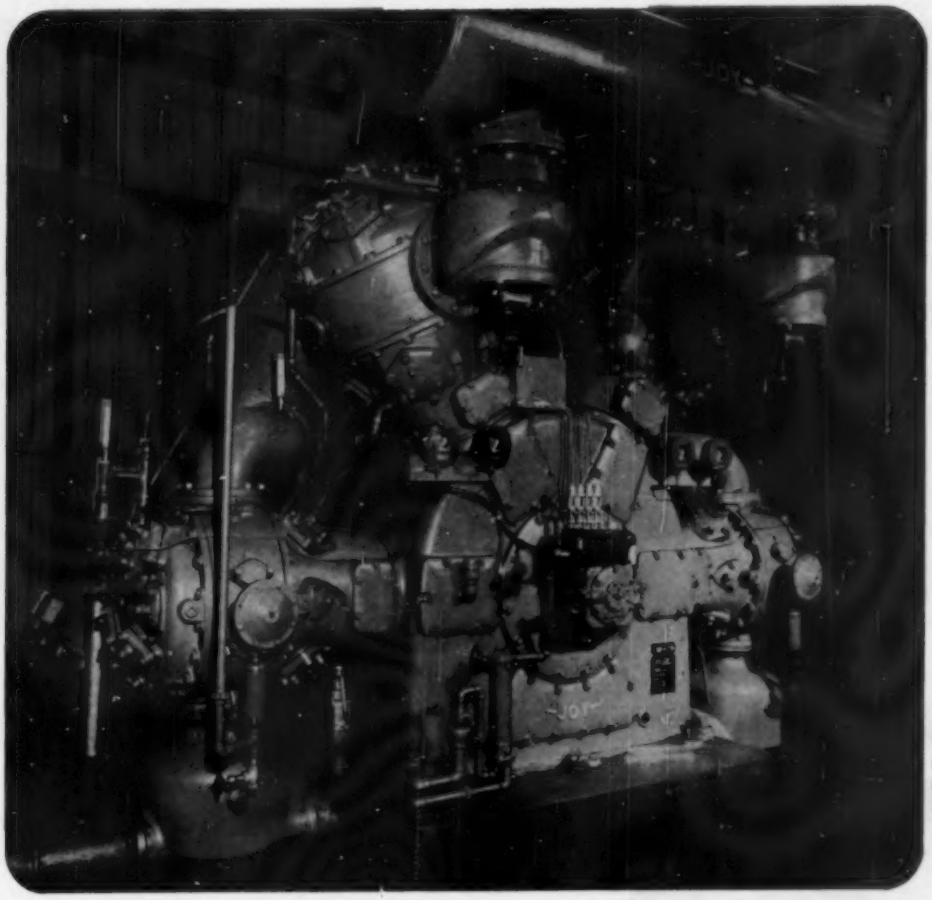
142 **Eddy Current Coupling**—Presented in 12-pp Bulletin GEA-6885 is extensive information on the Kinatrol line of eddy current coupling adjustable speed drives for 5 to 100 hp. Describes operating principle and contains data on torque capabilities, regulation and operation of entire package drive, cross-sections, dimension charts, and ratings. General Electric Co.

143 **Flexible Couplings**—Comprehensive selection data on flexible couplings is presented in 48-pp Engineering Catalog 60. Misalignment is described and basic coupling arrangements and load classifications are included, along with photos of couplings and installations, diagrams etc. Thomas Flexible Coupling Co.

INSTRUMENTS, CONTROLS

144 **Industrial Controls**—This 88-pp catalog presents comprehensive information on company's industrial

(More Bulletins on page 239)



This WN-224 Compressor supplies plant air to a modern foundry in Indiana.

Joy Design Means:

SIMPLE BASE WHICH CUTS COMPRESSOR INSTALLATION COSTS

The semi-radial design of Joy compressors makes installation a simple and inexpensive operation. Machines are completely assembled when shipped from the factory. Installation is accomplished by securing the frame to four studs set in the rectangular concrete pad. Form work is simpler, and the complicated alignment and assembly operations necessary with other compressors are eliminated. The net result is lower installation cost for your compressors.

Joy semi-radial compressors have many other features which enable them to supply plant air at minimum cost by reducing operating and maintenance expense. Your Joy representative can supply complete details, or write for Bulletin 925-15.

925

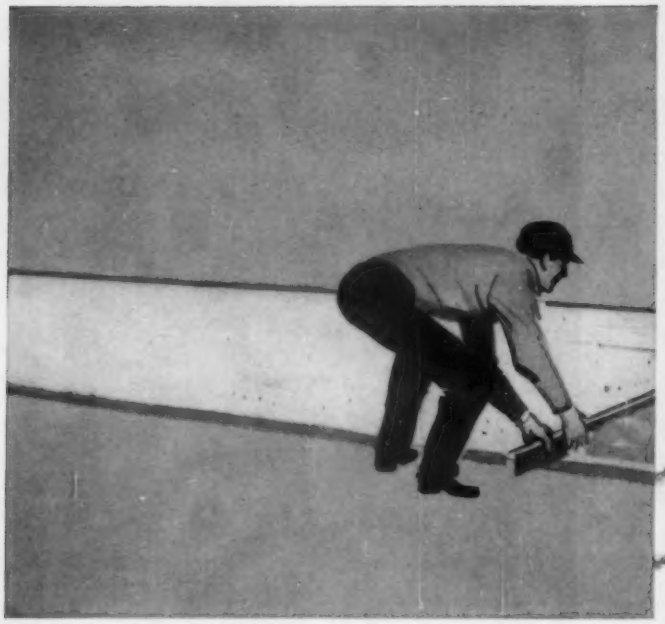
AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For more facts circle 515 on Reply Card



These five plants got built-in extras

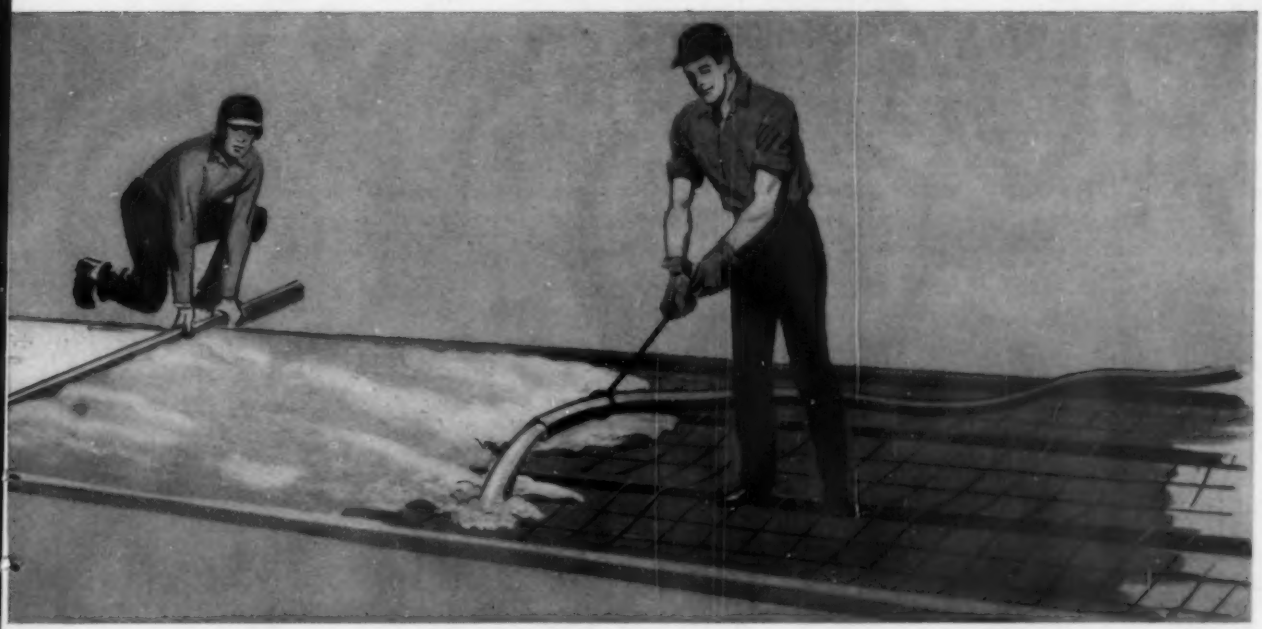
Sylvania Electric Products, Inc., Batavia, N. Y.
Architect: J. Fruchtbaum, Buffalo, N. Y.

F. N. Burt Co., Inc. Buffalo, N. Y.
Architect: H. E. Plumer and Associates, Buffalo, N. Y.

Bradley-Sun Div. of American Can Co.
Washington, N. J.
Architect: American Can Company Engineering Dept.

Behr-Manning Co., Troy, N. Y.
Architect: The Tuttle Co., Boston, Mass.

Martin Co., Orlando, Florida.
Architects: Connell, Pierce, Garland and Friedman, Miami, Florida.



from POURED GYPSUM ROOF DECKS

These five buildings were all constructed with Gold Bond Poured Gypsum Roof Decks, and they all have these three important structural advantages:

1. Extra strength. When complete, a Gold Bond Poured Gypsum Roof Deck forms a solid, steel-reinforced slab of gypsum rock. This monolithic slab is an integral part of the building, adding structural strength.

2. Provision for temperature movement. Reinforcing wire mesh and bulb tees provide for temperature movement of the slab without disturbing the solid base for built-up roofing.

3. Resistance to uplift. When bulb tees are welded to the main purlins and embedded in the gypsum concrete, they can resist uplift forces of up to 125 lbs./sq. ft.—80 lbs. more than normally required.

These unique properties, and many others, are winning approval for Poured Gypsum Roof Decks, everywhere. To learn about the fire-rating and other advantages of this low-cost deck, call your Gold Bond® representative, or write Dept. **PE-260** for complete technical information.

NATIONAL GYPSUM COMPANY, BUFFALO 13, NEW YORK

Gold Bond
BUILDING PRODUCTS

a step ahead of tomorrow

For more facts circle 516 on Reply Card

Checking out the Super COILIFE protected stator after being submerged for 99 days in Great Salt Lake.

Super COILIFE Triumphs Over Motor-Killing Brine Throughout 99-Day Endurance Test in Great Salt Lake

A Westinghouse stator recently spent 99 days of continuous torture at the bottom of Great Salt Lake. The salinity of the water averages 27% by analysis. Other than to rapidly gather salt until it was completely buried, the Super COILIFE* winding shrugged off the entire indignity. This Super COILIFE encapsulated unit meggered "infinity" . . . performance was identical to the pretest reading of the rewound motor.

This unprecedented torture test in the lake was not the only punishment inflicted upon this same motor. The river boat Sprague, over a period of 432 hours, had towed it underwater 1500 miles from Vicksburg, Mississippi, to Pittsburgh, Pennsylvania. In neither case was the Super COILIFE insulation affected by these rugged tests.

Acids, alkalis, oil, dirt and other contaminants are just as effectively . . . and permanently . . . stopped by Super COILIFE. A solventless epoxy is responsible for this extraordinary property of the insulation. Super COILIFE is thermally stable, chemically inert and stays elastic in response to thermal cycles of the windings. The exclusive process of applying Super COILIFE accurately controls the predetermined thin wall of the encapsulation for maximum dissipation of heat from windings. The surface will not crack or craze under severe operating conditions.

Super COILIFE is available only from Westinghouse Repair plants. Specify it for the rewinding and modernization of your motors to extend motor life and to protect your original investment.

For more information call your Westinghouse Representative, or write for Booklet B-7622 to Westinghouse Electric Corporation, P. O. Box 868, 3 Gateway Center, Pittsburgh 30, Pa.

J-95210-R
*Trade-Mark

Exclusive encapsulation process carefully controls the thin wall of Super COILIFE insulation . . . permits maximum heat dissipation, eliminates failures from contamination.

Stator being dragged from 99-day-long briny bath . . . since stator was inoperative during this entire period, Super COILIFE again has proved its ability to protect the windings from salt water and other contaminants.

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

For more facts circle 517 on Reply Card

ENGINEERED PRODUCTS

for Plant Maintenance

PROTECT EQUIPMENT FROM DAMAGE DUE TO HIGH PRESSURE, TEMPERATURE

Now, more than ever, plant engineers and maintenance men specify Garlock PK MECHANIPAK* Seals, LATTICE-BRAID* Asbestos Packings and GUARDIAN* Gaskets for safe, long lasting prevention of equipment failure due to high pressures and temperatures.

Garlock PK MECHANIPAK Mechanical Seals are easy to install and maintain. They are completely self-contained . . . no parts to put together. Rotating portion simply slides onto shaft; stationary portion positions quickly. Once installed, further adjustment is unnecessary. No parts of the seal move on the shaft or sleeve, eliminating wear on the shaft. Available in shaft sizes from ⅜″ to 3″ . . . operate at temperatures to 212°F, pressures to 150 psi, shaft speeds to 2000 fpm. Catalog AD-150.

Garlock LATTICE-BRAID Packings are engineered for longer packing life. They employ a through-and-through braiding construction. As illustrated above, each strand passes diagonally through the packing at a 45° angle. This unique construction makes a completely unified structure, resulting in greater strength. Since there is no single outer braid to wear through, Garlock LATTICE-BRAID will wear far beyond the limits of ordinary packings. Applicable against water, steam, oil, gases and chemicals to 700°F. Catalog AD-131.

Garlock GUARDIAN Gaskets provide a safe, positive seal against high temperatures and pressures of steam, oils, gases, liquids. Construction assures dependable sealing under varying service conditions. Strips of V-shaped metal, alternated with layers of asbestos or Teflon†, are spiral wound to form the gasket. A predetermined density is introduced into the gasket to satisfy application requirements. Used at temperatures to 1050°F, pressures to 2500 psi . . . available in round, oval, square, flat side, diamond, pear and other shapes in practically any size. Catalog AD-104.

GARLOCK

For more information, contact the nearest of Garlock's 26 sales offices and warehouses throughout the U.S. and Canada. Or, write for catalogs. The Garlock Packing Company, Palmyra, New York.

Canadian Div.: The Garlock Packing Company of Canada Ltd.

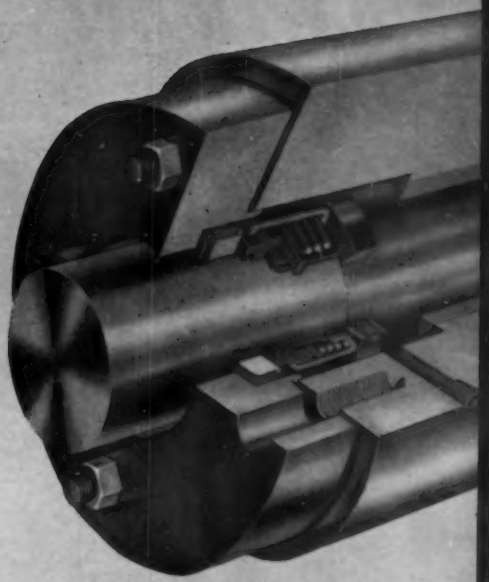
Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded & Extruded Rubber, Plastic Products

*Registered Trademark
†DuPont Trademark for TFE Fluorocarbon Resin

For more facts circle 518 on Reply Card

LATTICE-BRAID Packing lasts far beyond the limits of other packings . . . once installed, rarely requires further gland adjustment. Gives maximum service life over a wide range of temperatures, pressures. Only Garlock can give you LATTICE-BRAID.



PK MECHANIPAK Mechanical Seals are self-contained, can be installed simply and quickly, eliminate adjustment during operation. Offer leak-proof sealing without shaft wear.

GUARDIAN Gasket V-shaped metal plies have an automatic spring action that reacts to variations in compression, internal pressures, and temperature changes. Assure leak-proof seal under most severe conditions.

New from Wright!

Built-In Overload Protection for Operator, Load and Hoist with the New Wright Overload Cutoff*!

• Now, for the first time on any electric hoist, you can have safe, sure mechanical overload protection as a built-in feature with the **WRIGHT Overload Cutoff.** Designed and built to fit any new WRIGHT *Speedway* Electric Hoist, the Overload Cutoff unit you see pictured above is a compact, integral part of the hoist frame itself. As a result, it becomes a functional part of the hoist *at no sacrifice in headroom.* The WRIGHT Overload Cutoff is simple in design and should give dependable, trouble-free operation during the entire life of the hoist under normal operating conditions. Calibrated and sealed at the factory for the user's protection, the unit takes rugged abuse up to the critical point of overload—then instantaneously "breaks" the raising circuit of the hoist. This allows the load to be safely lowered to the floor and unhooked. Once this is done, the raising circuit of the hoist is again automatically restored.

The WRIGHT Overload Cutoff is available now as standard equipment on all new WRIGHT Frame 2 & 3 *Speedway* Electric Hoists, and as optional equipment on new Frame 1 & 1½ models.

Find out how WRIGHT *Speedway* Hoists equipped with Overload Cutoff can bring practical, fast-acting overload protection to your material handling operations. For complete information, write our York, Pa., office.

*Patent applied for

WRIGHT HOISTS

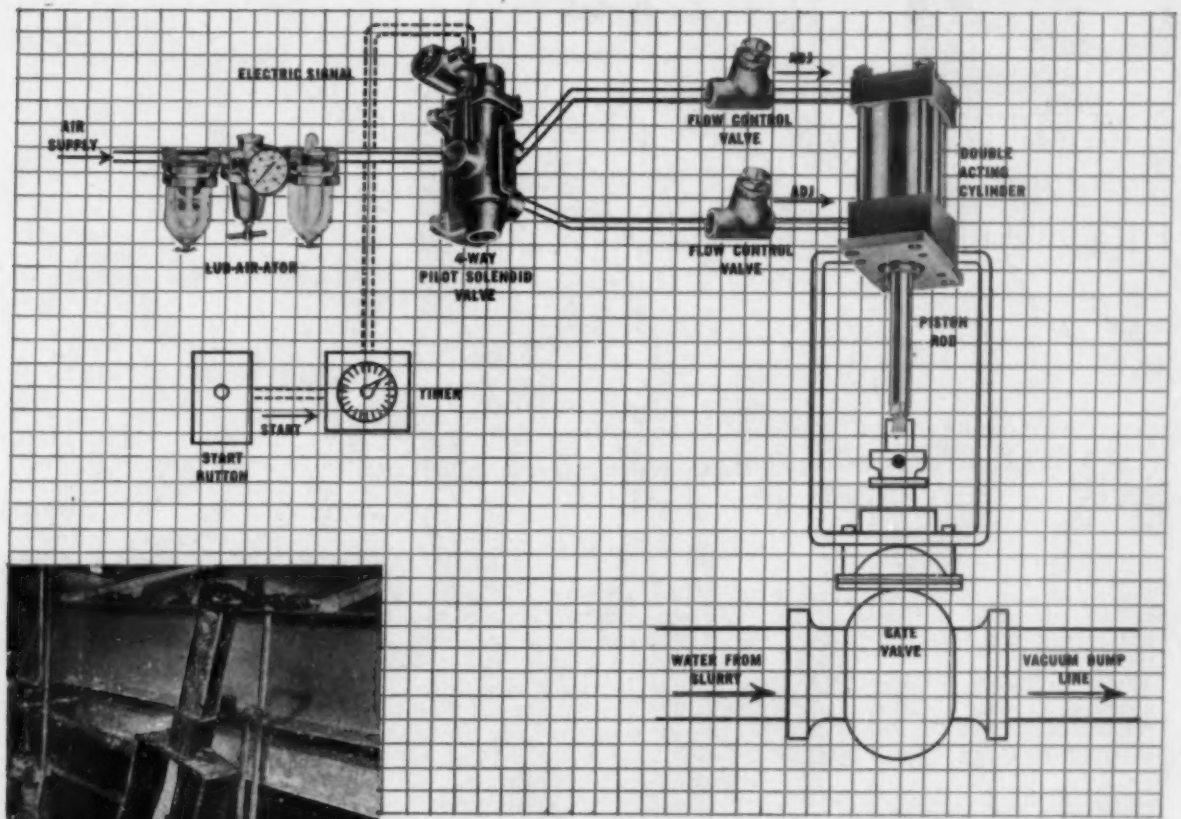
Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 519 on Reply Card

ACCO

PROCESSOR SPLITS PRODUCTION BOTTLENECK WIDE OPEN WITH HOOKUP OF STANDARD SCHRADER AIR PRODUCTS



Here's how one company automates with air. The hookup of Schrader Air Products in the large diagram actuates gate valves used in processing a slurry of raw asbestos fiber and cellulose at The Republic Seitz Filter Corporation, Newark, N. J. This used to be a slow, arduous manual job. Now air does it quickly, effortlessly, under "conditions particularly difficult for most kinds of automatic equipment . . . without a minute's downtime and without any maintenance whatever," says the company's Technical Director. Schrader-trained air specialists helped plan this practical set-up, as they have helped plan countless others.

Boost productivity of even complex operations quickly and economically, like this company . . . with *air!* Plan it yourself, or let our experts help. A system of Schrader Air Products can simplify almost any bottleneck job . . . whether it's processing, assembling, testing or packaging . . . pushing, pulling, holding, positioning or moving work repetitively.

With Schrader Products, you can run practically any production line faster, safer, more economically—and with tireless accuracy! Maintenance is surprisingly low.

These are benefits every shop needs. Take advantage of them all when you automate with Schrader . . . the finest, the most complete line of Air Cylinders, Valves and Accessories . . . plus countless ideas for cutting your operating costs.

Select air controls from the full Schrader line. Your Schrader distributor can help you pinpoint what you need. For more data, write:

Schrader®
a division of **SCOVILL**

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
484 Vanderbilt Avenue, Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

For more facts circle 520 on Reply Card

"WE RECOMMEND LUBRIPLATE FOR HENRY & WRIGHTS"

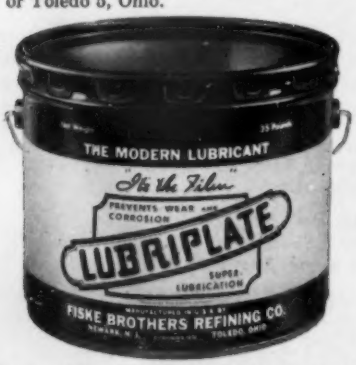
—says
The Hydraulic Press Mfg. Co.
A Division of Koehring Co.
of Mount Gilead, Ohio

"We have had excellent results with LUBRIPLATE in our new double crank design Henry & Wright Dieing Machines which we recently acquired from Emhart Mfg. Co., Hartford, Conn. This follows the same fine results Emhart had with LUBRIPLATE in single crank Henry & Wrights for many years. In the Operating Manual that goes with every new Henry & Wright machine, you will find that we recommend LUBRIPLATE."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.



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BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Lubrication Article In Demand

PLANT ENGINEERING:

"We would like to distribute your article 'Standardization in a Lubrication Program,' pages 136-139, of your October, 1959 issue and we will appreciate your granting us permission to reprint it.

"We are planning to print about 1300 copies for an international mailing list.

"In reprinting, we will be glad to show credit to PLANT ENGINEERING magazine and will appreciate your suggesting the wording you prefer for this purpose." *J. R. Hicks, Program Div., Products Dept., Socony Mobil Oil Co., Inc., New York, N. Y.*

▶ Permission cheerfully granted.—*Editors.*

Auditing Utility Bills

PLANT ENGINEERING:

"We are interested in contacting several firms who make a business of auditing utilities invoices. We know that there are a number of organizations in the country doing this work, but do not have their names and addresses. Local sources such as the Better Business Bureau, Dun & Bradstreet and our own auditors haven't been able to supply this information.

"We thought perhaps you might be able to supply us with the names and addresses of some of these firms. Any information that you can give us will be greatly appreciated." *James E. Harris, Vice President—Production, The Robinson Brick and Tile Co., Denver, Colorado.*

▶ These firms, which carry on a continuous study of bills and applicable rate structures, are indeed difficult to find through the usual sources, but we have forwarded the name and address of one such company to Mr. Harris.—*Editors.*

Hard Concrete Flooring

PLANT ENGINEERING:

"In the August, 1959 issue of PLANT ENGINEERING, there is an article entitled 'Cat's Steel Teeth Can't Chew this Flooring.'

"The article deals with concrete floor repairs on a quick-set, quick reuse basis.

"In the article, you refer to a new type of floor repair material called 'Emeri-Crete.' We are interested in getting more information on this product and also if there is a Canadian supplier. Would you be good enough to let us know the answers to the above? Thank you very much." *E. E. Woolmer, Maintenance Buyer, Monsanto Canada Ltd., Montreal, Que., Canada.*

▶ Further information about this flooring concrete is available from Walter Maguire Company, Inc., 60 East 42nd St., New York 17, N. Y.—*Editors.*

Pneumatic-Hydraulic Systems

PLANT ENGINEERING:

"We read with interest the article 'How To Design Pneumatic-Hydraulic Systems,' commencing in the October, 1959 issue of PLANT ENGINEERING.

"Will you please inform us whether reprints or additional copies of this article, when completed, will be available. We would like to have half a dozen copies for distribution throughout our organization." *H. J. A. Chambers, Director, Viceroy Manufacturing Co., Ltd., Toronto, Canada.*

▶ As yet, we have no plans for reprinting this article, which is the first in a series. Tear sheets are still available, though.—*Editors.*

Heat-Barrier for Windows

PLANT ENGINEERING:

"Please send us vendor information and prices on the glass-coating plastic described in your November, 1959 issue of PLANT ENGINEERING." *C. B. Olmstead, Asst. Plant Engineer, Bethlehem Steel Co., Shipbuilding Div., San Francisco, Calif.*

PLANT ENGINEERING:

"The November issue of PLANT ENGINEERING carries an article entitled 'Taking the Heat off Windows.' Could you supply us with a list of reputable contractors in our area capable of doing this work as described in this article?

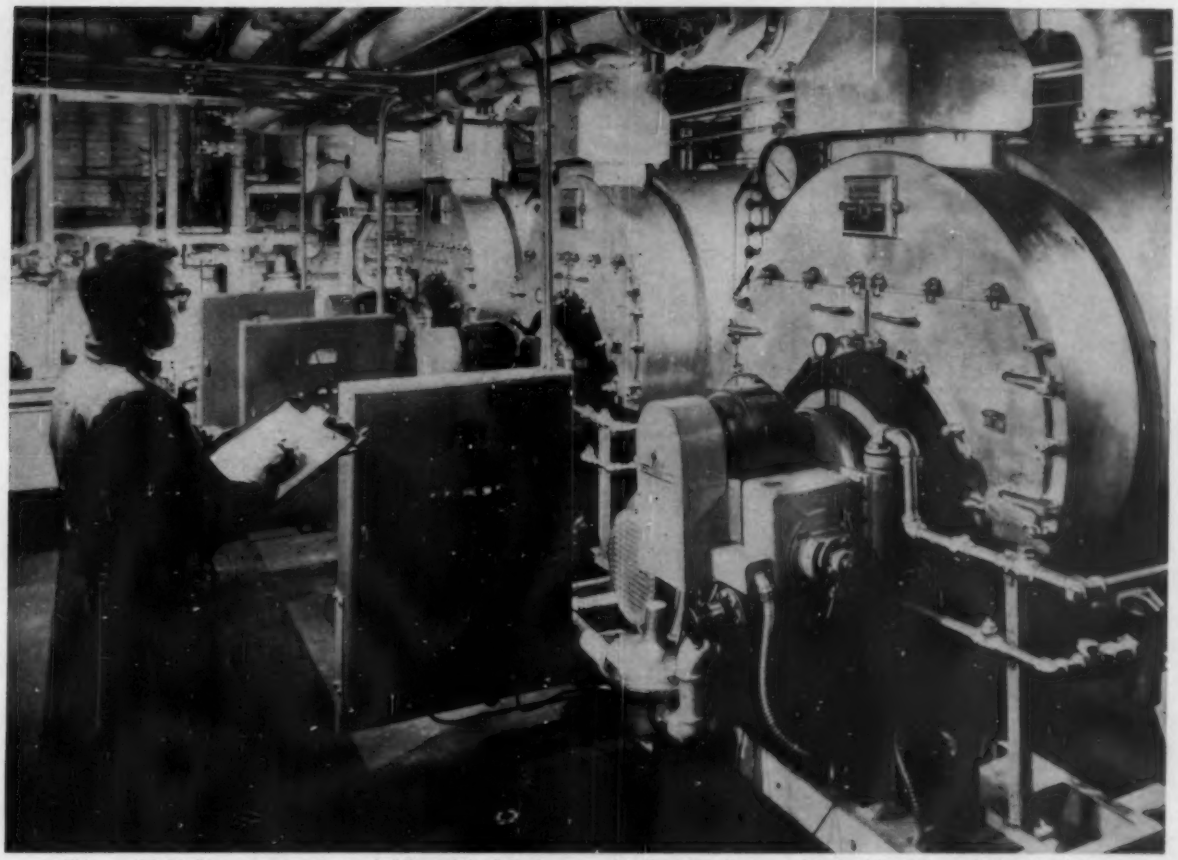
"We have used many of the ideas your magazine has presented in our plant, and enjoy your magazine immensely." *A. C. Schuman, Asst. Plant Engineer, Avon Products, Inc., Morton Grove, Ill.*

PLANT ENGINEERING:

"We are interested in obtaining further details concerning the glass-coating plastic mentioned in the ar-

The smart way to modernize

. . . specify your heating plant in one package



This remodeled boiler room serves the two buildings of the Columbus Dispatch newspaper plant, Columbus, Ohio. Fuels can be quickly changed in these three Iron Fireman-Kewanee gas-oil boiler-burner units. Consulting Engineers, John Paul Jones, Cary & Millar, Cleveland; Architect, Dan A. Carmichael, Columbus; Heating Contractor, Limbach Co., Columbus.

Iron Fireman burner with boiler — engineered as a single unit

These famous boiler-burner units are the products of two great specialists—each in its own field. They are engineered for each other. Included in one catalog, they can be ordered by a single model number from one set of specifications.

Plenty of reserve power

You can feel *safe* in specifying Iron Fireman equipment. These thoroughly engineered units are conservatively rated. The normal firing rate is a comfortable cruising speed—less strain, low maintenance, quiet operation, higher efficiency —and that big extra capacity is always standing by to pick up extra loads.

Compact and complete

These complete steam or hot water generating units require little more than service connections. Automatic controls, air and fuel systems are built in. No special boiler settings; low headroom; no high stack.

Please mail coupon for catalog and specifications.

IRON FIREMAN.

AUTOMATIC FIRING EQUIPMENT
FOR OIL, GAS, COAL

IRON FIREMAN MANUFACTURING CO.
3065 West 106th Street, Cleveland 11, Ohio
(In Canada, 80 Ward Street, Toronto, Ontario)

Please send catalog and specifications on following equipment:

☐ Complete boiler-burner units
☐ Forced draft firing unit only

Name_____

Firm_____

Address_____

City_____ State_____

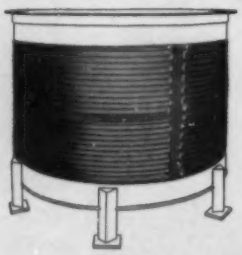
For more facts circle 522 on Reply Card

HEAT YOUR TANK THE MODERN LOW COST WAY

with superior

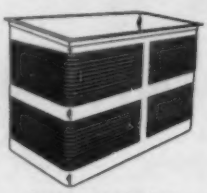
DEAN® PANELCOIL

Regardless of your operation or the size or shape of your tank, if it is to be heated or cooled, Dean Panelcoil can do the job more economically and more efficiently than old-style pipe coil or jacketing.



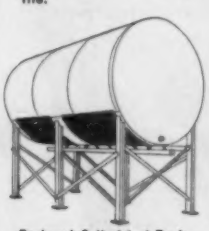
Open Cylindrical Tank

- Higher Btu Transfer per Unit Surface Area.
- Sturdy, Lightweight Construction for Long Operational Life.
- Easy to Remove Panelcoil for Cleaning or Replacement.
- Available in standard single and double embossed Panelcoil, in widths from 12" to 29"; in lengths from 23" to 143" flat or rolled to size to fit any tank. Standard Panelcoil made in "L"-grade carbon steel and type 316 "L" stainless steel. Also in Monel, Carpenter 20, Nickel, Hastelloy, Nionel and Titanium — up to 14-gauge for embossed stainless Panelcoil.



Open Rectangular Tank

- Easy to Calculate — Engineering cut to minimum with Dean's complete engineering data file.



Enclosed Cylindrical Tank

For Complete Data — Write for Data Sheet 15-60 Series, and Price Bulletin 259.

DEAN PRODUCTS, INC.
622 Franklin Avenue, Brooklyn 38, N. Y.
STerling 9-5400
Backed by 25 Years of Panel Coil Manufacturing

For more facts circle 523 on Reply Card

BACKTALK— FORETHOUGHTS

ticle entitled 'Taking the Heat off Windows' in the November, 1959 issue of PLANT ENGINEERING.

"Would you kindly supply us with the names and complete addresses of manufacturers or distributors of such coatings." *W. F. Kraemer, Purchasing Manager, Brandt Automatic Cashier Co., Watertown, Wis.*

PLANT ENGINEERING:

"Please send us further information on the manufacturers of the coating mentioned in 'Taking the Heat off Windows' on pages 108 to 111 of your November, 1959 issue." *J. L. Kelly, Plant Supt., Pollock Paper Co., San Jose, Calif.*

► These are but a few of the requests we have had for more information on a glass-coating plastic compound which, sprayed or flowed on to windows, lowers heat transmission through glass. Inquiries have been forwarded to the Transparent Glass Coatings Co., 533 North La Cienega Blvd., Los Angeles 48, Calif.—*Editors.*

Roll-Form Die

PLANT ENGINEERING:

"On page 56 of your October, 1959 issue, you describe the Di-Arco Rol-Form die. Who makes it, please?" *Jay Claster, Claster Steel Co., Inc., Williamsport, Pa.*

► This "roll-form" die is used on a press brake in a model shop. We have passed along this request for more information about it to the manufacturer, the O'Neil-Irwin Mfg. Co., Lake City, Minn.—*Editors.*

Standard Fare

PLANT ENGINEERING:

"Your series on design in reinforced concrete has been excellent. In spite of our policy of removing 'Construction Briefs' from the PLANT ENGINEERING magazine, we find it helpful to keep on file the reprints of your articles. Our last reprint includes the articles from PLANT ENGINEERING, October, 1956—October, 1957. May we have two copies of reprints on all 'Construction Briefs' following the above series up to the most current available? We shall accept any charges levied for this service." *E. A. Zywiec, Asst. to Chief Engineer, Michigan Seamless Tube Co., South Lyon, Mich.*

► "Construction Briefs" booklets in which are reprinted articles published between December, 1957 and December, 1958, have been mailed to this reader. The cost is 75 cents each. Another booklet containing reprints of the series currently appearing in PLANT ENGINEERING will be available later this year.—*Editors.*

Reading List for PM

PLANT ENGINEERING:

"To begin with, I would like to commend you on your fine publication, PLANT ENGINEERING. It is an immense help to me in my plant engineering maintenance problems at Lockheed Missiles and Space Division.

"Many of the articles that appear in your magazine are extremely interesting but at this particular point in time I would like to make an inquiry as to what information is available, either in your file or contacts, as to preventive maintenance programs carried on by other organizations. The information I require would entail frequency of inspection, amount of machinery and equipment and the annual man-hours spent by representative companies in their preventive maintenance programs. I would appreciate any help you can give on this request." *W. L. Gervais, Manager, Maintenance—Plant Engineering, Missiles and Space Div. Lockheed Aircraft Corp., Sunnydale, Calif.*

► Happy to hear that we are of assistance to Mr. Gervais. We have sent him a selection of articles which we believe will give him considerable information on preventive maintenance programs.—*Editors.*

That's the Way . . .

PLANT ENGINEERING:

"Can you help us? We need a machine that would test and gage the stress or breaking point under pressure for one cookie, diameter up to four inches, thickness up to one quarter inch. It should be simple, fast and require little time on the production line to determine if cookies will ship and handle through to the grocer under normal handling without breaking problems. *John J. Kloss, Jack's Cookie Co., Inc., Charlotte, N. C.*

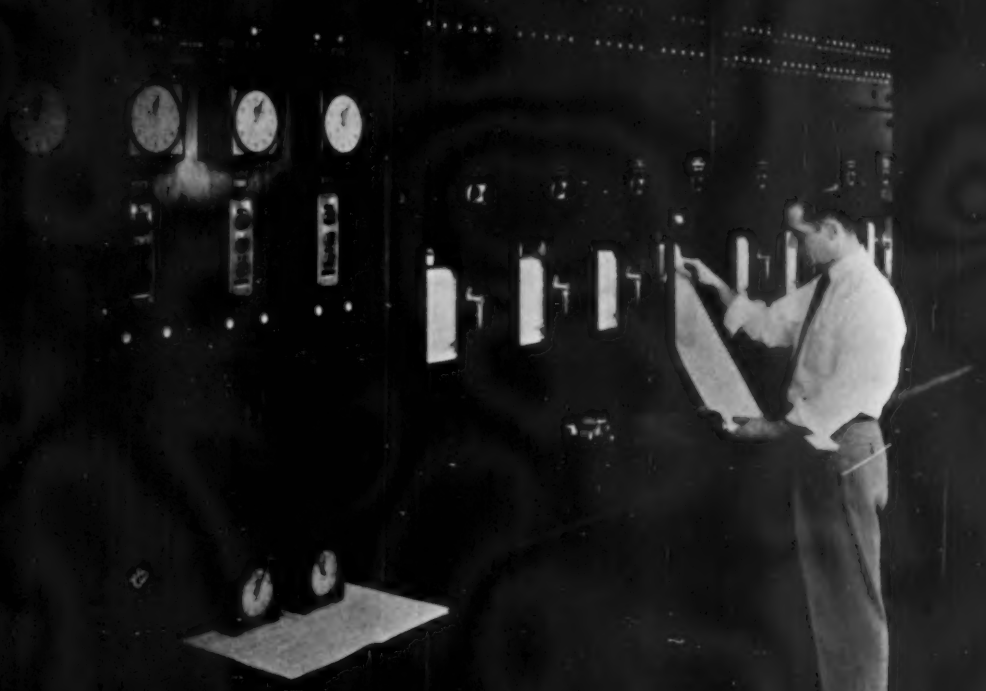
► Not being large-scale cookie bakers, we asked the American Institute of Baking what they thought would be a solution to this problem. According to them, this problem is as old as the cookie industry itself and it still had not been solved. The Institute suggested that the Biscuit Bakers Institute at 7702 North Clark St., Chicago, Ill., might be able to help.—*Editors.*

For more facts circle 524 on Reply Card——→

General Electric Control Provides...

MEASURABLE ADVANTAGES

to save time and money in your manufacturing or processing operation



Laboratory panel establishes ratings of overload relays produced at General Electric's General Purpose Control Department

GENERAL ELECTRIC

AUTOMATED TEST PACK on production line subjects every Size 2 magnetic starter to complete series of electrical and noise tests. Other G-E control products are subjected to similar tests.

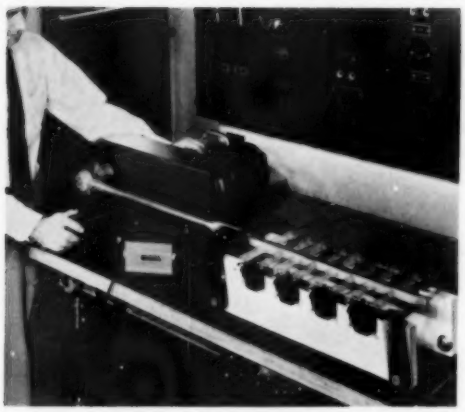
Complete testing program helps assure . . .

CONTROL RELIABILITY YOU CAN COUNT ON

Greater reliability—one of many *measurable advantages* of General Electric control—is proved daily by G.E.'s rigid program of production-line and laboratory testing.

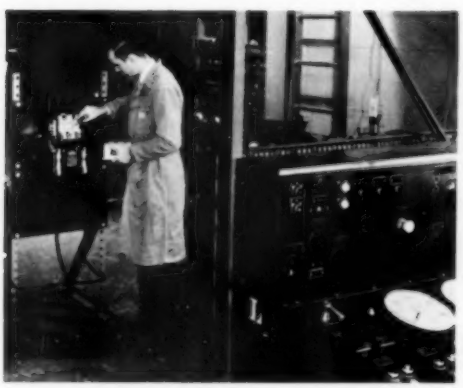
Three types of tests include development tests and evaluation of products and features; assembly line tests like the "test pack" shown above; and a Quality Audit program providing electrical and mechanical tests of randomly selected samples from the different production lines.

Supported by this thorough testing program, G-E controls provide the outstanding reliability that means longer life, and less downtime when installed in your plant.

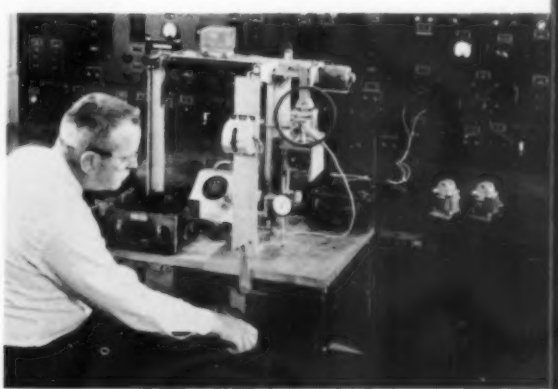


LIFE TESTS are run on random samples of production line controls. Here, manual starters are actuated on special accelerated-life testing equipment in G.E.'s control laboratory.

DUST TESTS are conducted in specially designed box. Operation of starter contacts in Nema I enclosure is checked under rigorous conditions such as cement dust.



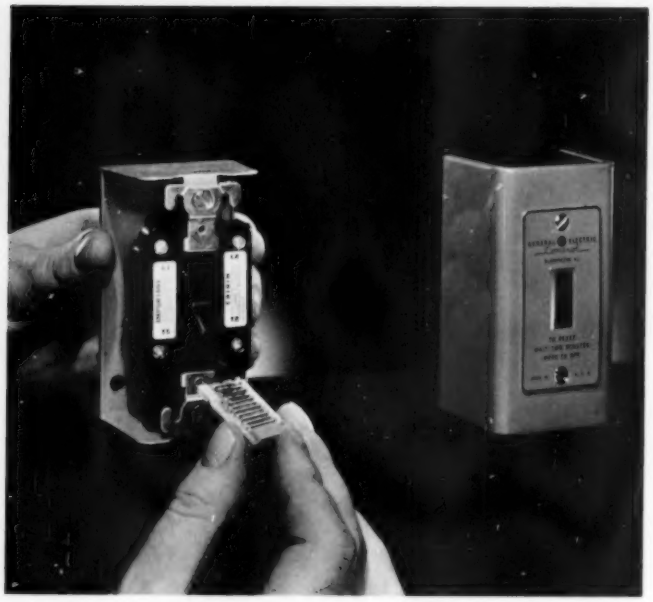
POWER TESTS are conducted to check such electrical characteristics as load life, interrupting ability, and effect of short-circuits in excess of the UL 5000 ampere requirement.



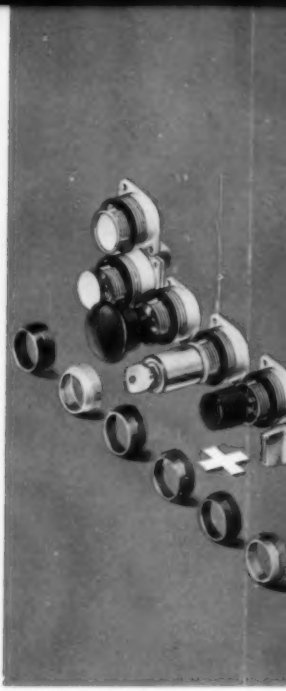
SPECIAL LABORATORY EQUIPMENT evaluates design characteristics of new products. Here, solenoid electro-magnet is tested to determine pull-stroke characteristics.

See left page and inside for description of measurable advantages in G-E general purpose control devices (through 200 hp, 600 volts).

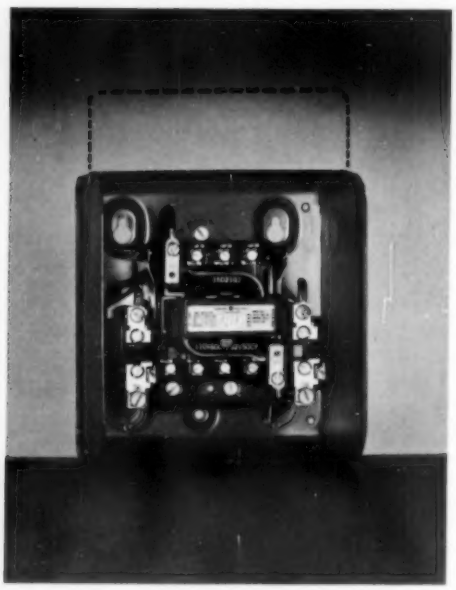
- **Reliability you can count on**
- **Greater convenience**
- **More flexibility**
- **Product innovations**
- **Smaller size**
- **Ease of buying and specifying**



GREATER CONVENIENCE is a significant advantage of all G-E controls. Devices are designed to be exceptionally easy to install, maintain, and use. Examples: Plug-in heater, straight-through wiring, wrap-around cover of CR101 manual starters (see above); also snap-slide construction of 100 Line Magnetic Starters which provides for complete disassembly in less than a minute.

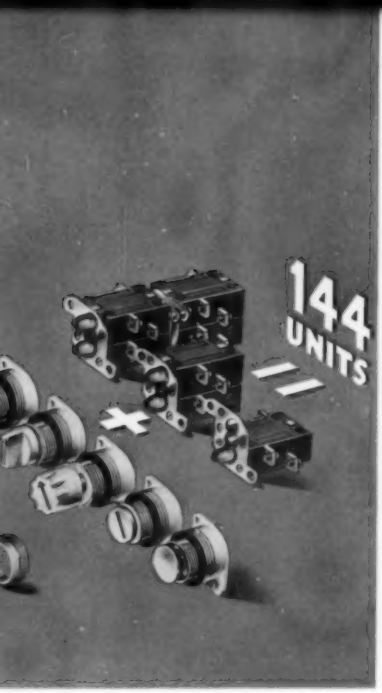


MORE FLEXIBILITY of G-E cont
by reducing the number of de
possible, G-E controls are des
struction from basic units or
Only 17 different items need be
General Electric oil-tight push

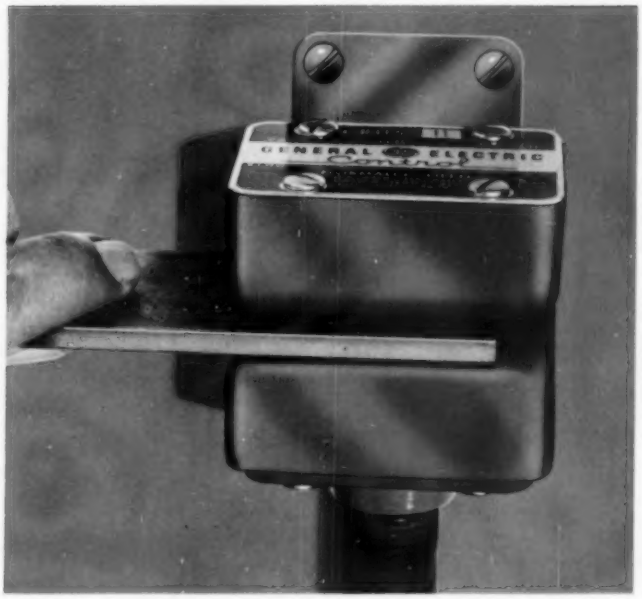


SMALLER SIZE of G-E controls allows better use of space, improved design of your equipment. Examples: Sizes 0 and 1 magnetic starters are 42% smaller than previous open forms, yet provide 32% more wiring room in enclosure. Also, 2-in-1 oil-tight illuminated pushbuttons save space by eliminating need for separate push button and indicating light.

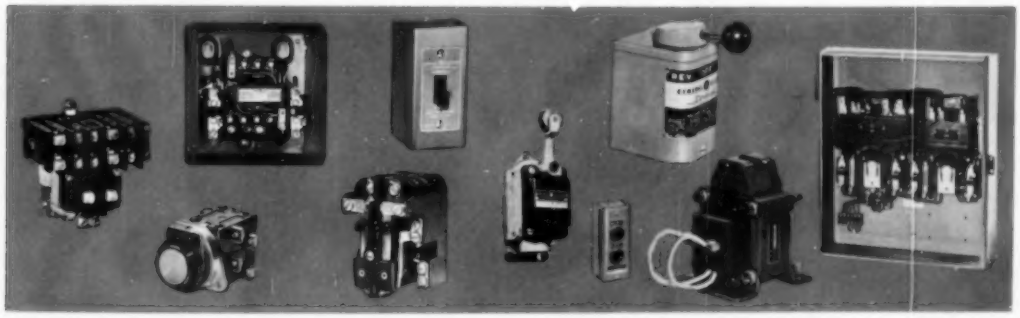
EASE OF BUYING AND SPECIFYING saves time and money, too. Nearby distributors offer complete stocks, helpful service. Control modification centers back up distributors to provide faster service on "specials" when required. Easy to use General Purpose Control Catalog (GEC-1260) gives convenient buying information, guide-form specifications.



ontrol means measurable savings to you
devices you need to stock. Wherever
designed to allow building-block con-
or modification in the field. Example:
l be stocked to get 144 combinations of
sh buttons.



PRODUCT INNOVATIONS give you measurable advantages by providing new and better ways to accomplish control operations in your plant. A notable example is the unique G-E vane-operated limit switch operated by a metal vane passing through a magnetic field. Unit outlasts conventional limit switches at least 3 to 1 because arms, levers and shafts are eliminated.



COMPLETE LINE of G-E general purpose control includes full voltage magnetic starters, reduced voltage starters, manual starters, new drum switch, contactors, relays, limit switches, solenoids, push buttons and other pilot devices such as pressure, vacuum, float and plugging switches.

Measure These Advantages In Your Operation

The General Electric control features described here are just a few of the many valuable advantages available now on the complete line of G-E general purpose control. Each of these advantages can actually be measured—either in the laboratory or in application—to prove the savings of time and money which will result in your own operation.

We invite you to evaluate for yourself the measurable advantages of any device in the complete General Electric general purpose control line.

Contact your nearby G-E Apparatus Distributor, or write for Catalog GEC-1260, General Electric Co., Schenectady, N.Y. for full information. 733-53

you get **MEASURABLE ADVANTAGES**
WITH GENERAL ELECTRIC CONTROL

GENERAL ELECTRIC

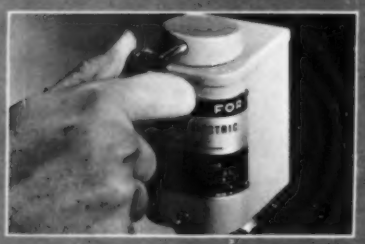
NEW

General Electric DRUM SWITCH

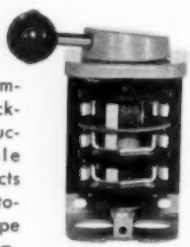
No tools needed to change from maintained to momentary contact

1. Unscrew handle and remove.

2. Lift cap slightly, turn 180°.



3. Reposition cap, replace handle.



FEATURES: Compact size • Shock-resistant construction • Visible long-life contacts • Large, easy-to-wire, screw-type terminals • Separate conduit openings for incoming and outgoing leads • Wrap-around cover with 180° accessibility for easy installation.

Built to last! Easy to install! Reliable "positive-feel" action!

For applications requiring manual control of travel direction, General Electric's new CR102 A1 Drum Switch offers exceptional durability plus convenience features that save installation and modification time.

Rated two hp, 230 volts maximum, single-phase and polyphase, this new drum switch has a smooth handle action with solid "positive feel" that machine operators like.

Check the time- and cost-saving features at left. Ask your nearby G-E distributor for GEA-7000, or write to Section 733-51, General Electric Co., Schenectady 5, N. Y.

You get **MEASURABLE ADVANTAGES** with General Electric Control

GENERAL ELECTRIC

Leading the field!

MODINE

steam and hot water unit heaters

HORIZONTAL
Can be direct-from-pipe suspended . . . without other supports. Vertical louvers may be added for complete directional control. 24 sizes.

VERTICAL
Available in 28 sizes . . . choice of 4 air deflectors. Depending upon size selected, mounting height may vary from 10 to 60 feet.

POWER-THROW®
For hard-to-heat locations. High-velocity discharge assures exceptionally long heat-throw . . . up to 140 feet. Offered in 10 sizes.

The chart shows the results of a brand preference survey made by a leading industrial magazine. In a poll of *men who buy* steam and hot water unit heaters, Modine finished well out in front.

Since the 1920's, Modine has been the industry pace-setter . . . in performance, styling, economy. Features of today's Modine line include: three distinct designs . . . horizontal, vertical, Power-Throw; lightweight, yet extremely durable construction; high capacity on steam *or hot water* systems; die-formed casings; a complete line of low-outlet-temperature models for high pressure systems; extra-heavy die-formed fins for added strength and maximum heat transfer; vertical fin design that discourages accumulation of dust and dirt.

CATALOG 158 *has complete information. See your distributor or write Modine Manufacturing Co., 1563 DeKoven Ave., Racine, Wisconsin.*

Immediate delivery from local stock!
Modine wholesalers are located in all principal cities. Call the Modine representative nearest you . . . he's listed in the yellow pages.

SU-1389

Also from the world's most complete unit heating line

Modine
FIRST NAME IN UNIT HEATING

For more facts circle 525 on Reply Card

←——For more facts circle 524 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Aircraft Fuselages Given Simulated Flight and Weather Tests in Plant-Engineered Safety Chamber

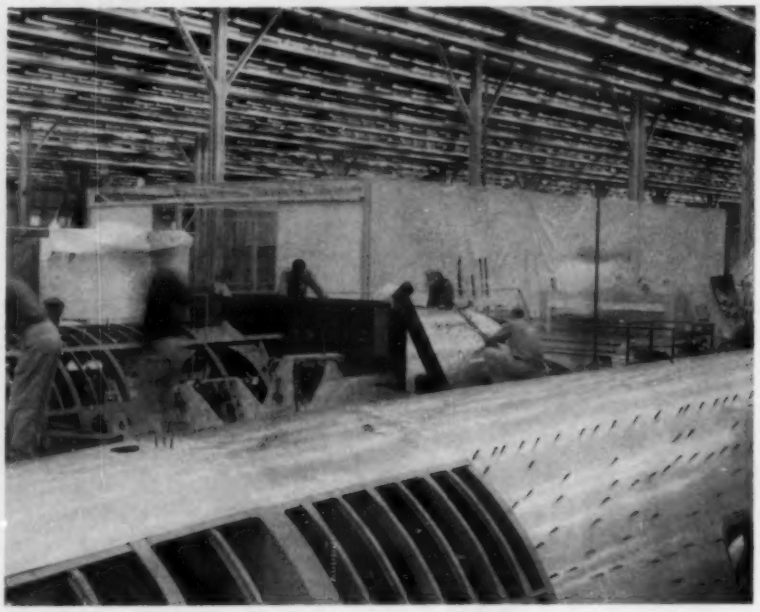
CONSTRUCTION of a safety chamber in which JetStar fuselages will be isolated for rigorous testing under simulated flight and weather conditions, is nearing completion at our plant.

The concrete, steel and canvas structure, designed by our plant engineering department, accommodates two fuselages at one time.

Over-all dimensions of the structure are 67 ft in length, 37 ft wide and 17 ft 6 in. high. The building is of structural steel which is anchored to the concrete floor of the main production plant.

All four sides and the roof are webbed with eleven gage galvanized two-inch mesh chain link wire. Three layers of 12-oz duck canvas cover all vertical surfaces outside the chain-link webbing, providing maximum safety to employees in the event of a fatigue failure.

A 21-oz, reinforced, canvas curtain, which is raised and lowered by an electric motor, bisects the length of the structure. This divider not only protects one fuselage from the other during pressurization tests, but also permits both aircraft to undergo different tests simultaneously.



Safety chamber will permit rain and pressure tests to be conducted simultaneously while nearby employees are protected from hazards in case of fatigue failure.

These dual tests enable one fuselage to be pressurized to 12.7 psi—1.33 psi in excess of the maximum required to simulate a cabin altitude of 8000 feet—while the other fuselage is subjected to a three to five inches-per-hour rain storm.

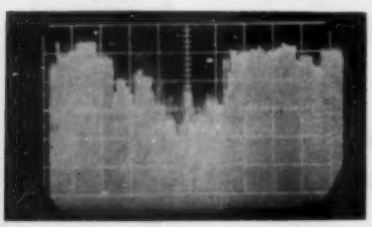
Controls for both tests are handled by one man behind a protective steel shield while another, in an equally protected position, serves as observer. Both air and water pressure systems feed off plant lines.

When the test chamber becomes fully operational, JetStar fuselages can be completely tested, raising the cabin pressurization from zero to 12.7 psi, and back to zero in 30 minutes. *From a release of Lockheed Aircraft Co., Marietta, Ga.*

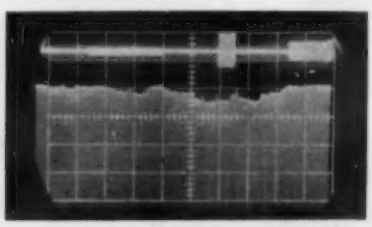
Controlling Voltage Drop Automatically in Welding Operations Prevents Bad Welds

IN ANY INSTALLATION of spot welders, where the machines are firing at random, occasional overlapping of firing is bound to occur. When this happens, voltage drop in the power system can become excessive. Then bad welds result.

This situation that has been corrected at Ford Buffalo Stamping plant, Buffalo, N. Y., by the use of an automatic welder load control which provides maximum production rate under adjustable guaranteed load conditions. The system also guarantees the voltage to the welders by preventing any welder from firing unless the line voltage is greater than a preset value.



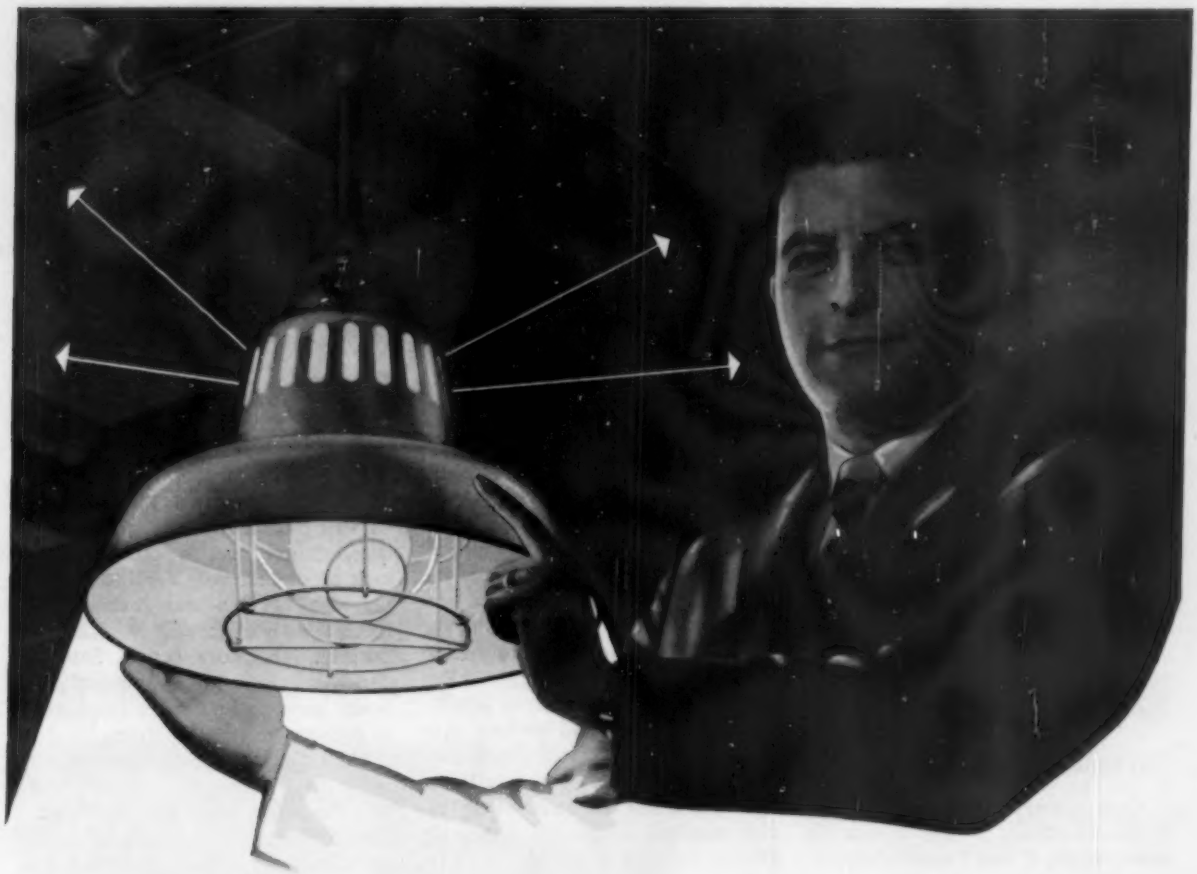
Erratic scope trace shows line voltage variation during firing without control.



Steady trace using load control shows greatly improved voltage regulation.

At any time, when a welder is ready to weld and wants to come onto the line, a determination is made as to whether this particular welder's load can be added to the load now being carried on the line, without dropping voltage below the preset value. If the answer is "yes,"

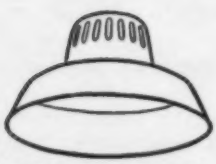
(Continued on page 42)



Now you can get optional

SLOTTED Reflectors

on these Crouse/Hinds Lighting Fixtures



Explosion-proof—Type EV, Dust-ignition-proof—Type DL in slotted dome or angle reflectors.

Vapor-tight, weather resistant types V and VM in slotted dome or angle reflectors.

Reduce fatigue, accidents and worker tension; improve working environments and employee relations. In both original and replacement installations in major plants, the new slotted reflectors—exclusive with Crouse-Hinds—produce the following results:

- Elimination of dark, dungeon-like areas above reflectors
- Elimination of harsh brightness contrast, improving visibility and seeing comfort
- Reduction of fatigue of workers, and accidents due to fatigue
- Increase of production in machine work, assembly and inspection operations
- Reduce fixture operating temperature and worker discomfort from reflected heat, especially with low-hanging fixtures
- Reduced accumulation of dirt and dust, due to improved air circulation through reflectors
- Slotted reflectors are white enamel finish inside and out

FOR COMPLETE INFORMATION on all Crouse-Hinds lighting fixtures equipped with the new slotted reflectors, call your nearest Crouse-Hinds distributor, or write us.

CROUSE HINDS
SYRACUSE NEW YORK

OFFICES: Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tulsa Washington
RESIDENT REPRESENTATIVES: Albany Baltimore Reading, Pa. Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT. CROUSE-HINDS INSTRUMENT COMPANY, INC., SILVER SPRING, MARYLAND

For more facts circle 526 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

the welders fire. If the answer is "no," the welder waits momentarily, until a firing welder somewhere else on the line completes its firing and drops off. In many cases there will be no waiting at all.

Ford plant officials report that their voltage drop is now being held to a minimum of 6 per cent. And these advantages in quality control are being accomplished with no reduction in speed of production.

The control system takes into consideration all other electrical equipment operating in the plant, besides the welders which are connected to the system. *From a release of Instrument Control Co., Minneapolis, Minn.*

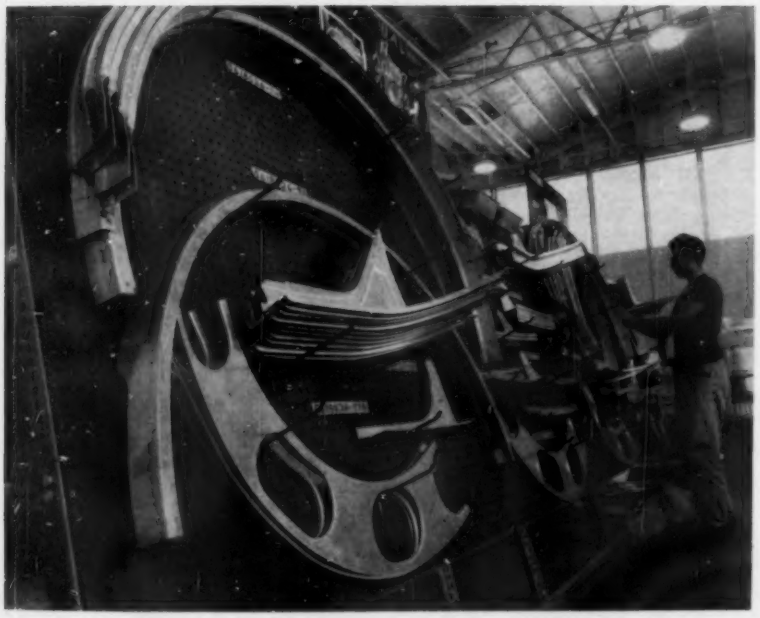
Streamlined Blueprints

OUR BLUEPRINTS are undergoing a radical change in their format. In many cases, it was found, blueprint users required only the "picture" from the blueprint; others, only the written data. In the streamlined version, the picture print remains the same, but the written information will be documented in looseleaf folders which are easier to handle, both in carrying and seeking specific data. Both sets of documents will be available in separate packages but under the same identification number. Users will draw only the information required.

Comparison of cumbersome blueprint and small, looseleaf format now in use.

Changes are cranked in easily. Changing informational data involves replacing pages in the looseleaf folders. For "picture" blueprints, changes will continue to be attached until it is economical to reprint the drawing. *From a release of Boeing Airplane Co., Seattle, Wash.*

"Room Service" for Parts Saves Time, Space, Money



Portable A-frames padded with foam rubber, with pegboard sides and rubber-covered hooks hold airplane parts in exact assembly sequence. Wall-hung pegboards provide self-service "supermarket" facility in assembly areas, keep small items handy. (From a release of Ryan Aeronautical Co., San Diego, Calif.)

Tests on UPVC Piping

RESULTS OF A YEAR-long test of unplasticized polyvinyl chloride for corrosive waste drainage piping have been reported in a paper published by a University of Louisville research associate.

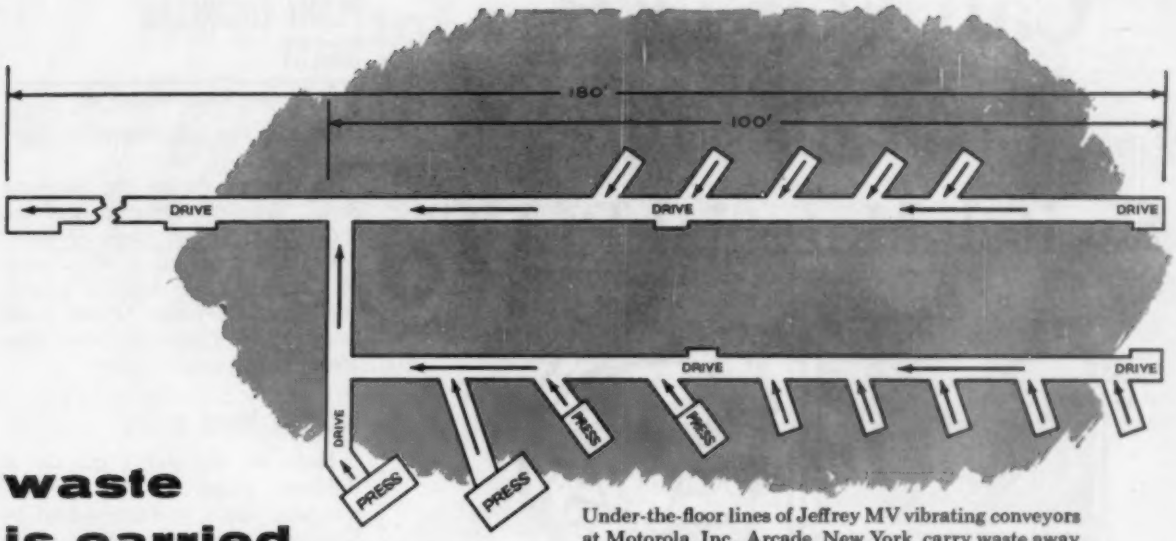
The study showed that 1½-in. UPVC p-trap showed no sign of deterioration due to chemical attack or solvation in a 326-day test period. The trap was installed in the drain line serving a general-purpose laboratory bench. Service conditions were those imposed by acids, solvents and bases employed in routine chemical analyses.

Periodic inspections showed no evidence of leakage at joints, nor of bleeding, and no significant changes in weight or thickness. Tests indicated that UPVC may be used safely where acetone, toluene and other aromatics will be encountered occasionally or will be used extensively in dilute solutions. UPVC piping also satisfactorily handles all solutions normally used in general chemistry laboratories; it has a low fouling tendency and provides optimum flow conditions; it is nonsparking; it is not subject to galvanic or electrolytic action; it does not pit or corrode; it is light weight and easy to join; and it shows insignificant deterioration in service. *From a release of Tube Turns Plastics, Inc., Louisville, Ky.*

Epoxy Protects Pickling Stack

CORROSION PROTECTION from acid fumes and condensation present in the fume exhaust stack of a continuous pickling line, has been achieved at low cost by the Acme-Newport Steel Co., Newport, Ky.

Two years ago, an epoxy resin coating was troweled on the stack interior during a weekend shutdown. Time required totaled 28 man-hours; total cost was $1800. The stack is 70 ft high by 9 ft diameter. Prior to application of the coating,



Under-the-floor lines of Jeffrey MV vibrating conveyors at Motorola, Inc., Arcade, New York, carry waste away from the punch presses as fast as it is produced. Engineered by Conveyor Systems, Inc. of Chicago.

waste is carried along smoothly, quietly on the JEFFREY MV CONVEYORS

MOTOROLA's punch press department, with its fourteen busy presses, is kept neat at all times. Metal trimmings and punchings from the presses fall directly through chutes onto Jeffrey vibrating conveyors below the floor. These keep this waste moving toward the end of the building, where a bucket elevator lifts it to an overhead bin, to be hauled away.

Jeffrey MV conveyors move material *fast*, lifting it from the deck with a rapid forward motion; no sliding action to cause wear. They are simple in design, dependable in operation and rugged in construction, so they're economical to operate and low on upkeep.

Bulletins describing Jeffrey mechanical conveyors of all capacities—light, medium and heavy—are available. For copies, write The Jeffrey Manufacturing Company, 905 North Fourth St., Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT . . . TRANSMISSION MACHINERY . . . CONTRACT MANUFACTURING

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"Call FOSTER... they'll ship Switch Material PLUS"

Right! L. B. Foster Company will ship switch material "*plus*" any standard rail section (new or relaying), crane rail and accessories, and track tools —everything you need, at lowest possible costs. Foster is your fastest, most dependable source for every rail and track item required for industrial sidings or in-plant trackage.

One more "*plus*": the advantage of lower freight rates from Foster's nationwide warehouses and stocking points. To help select materials best suited to your job, call the Foster Track Specialist.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

the stack was sandblasted to bare metal.

Inspections during the two-year period since the application of the epoxy revealed no signs of wear, deterioration or attack. The lining was examined for hairline cracks, but none was found. *From a release of Shell Chemical Corp., New York, N. Y.*

Ductwork Moves to Job

HOW TO DRY PAINT quickly at different points on the production site, was a problem solved by Spartan Aircraft Co., Tulsa, with the installation of flexible duct work on mobile homes.

The inside of the mobile home is painted after assembly. The paint is dried by hot air which is pumped

Flexible duct takes hot air to any part of production line to dry home interior.

into the interior of the trailer through a portable connector at the door. Since the sizes of the home vary, the door openings are not always at the same position in the drying room. This suggested a moveable rather than a rigid duct work for the supply of hot air from an overhead blower. Flexible ductwork made by Flexible Tubing Corp., Guilford, Conn. was used.

The system is used to exhaust fumes from the trailers. *From a release of Reeves Bros., Inc., New York, N. Y.*

Heat Barrier

DRYING MACHINE operators at a chemical plant are protected from the extreme heat by a barrier of

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This shop cuts costs by using STANICUT *Oil 137 BCS*

Machines seven metals, one plastic with this one cutting fluid

Shank Manufacturing Company, Chicago, cuts production costs three ways by using STANICUT Oil 137 BCS. (1) The 15 Warner & Swasey Lathes are never down for change of cutting fluid when the metal being worked is changed. There's no time lost with shutting down, cleaning up and changing oil. (2) There are no losses from the use of the wrong cutting fluid. (3) Floor space is used for productive machinery instead of being tied up as storage space for barrels of different cutting fluids.

Titanium, brass, alloy steel, aluminum and seven grades of Stainless plus Teflon plastic are all worked on the machines. Latest equipment, a reputation for good work, experienced operators and on-time delivery keep business coming to Shank. STANICUT Oil 137 BCS helps Shank hold down manufacturing costs.

Does cutting costs with a cutting fluid interest you? Let one of Standard Oil's experienced lubrication specialists show you how STANICUT Oil 137 BCS can do it. Call the Standard Oil office nearest you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

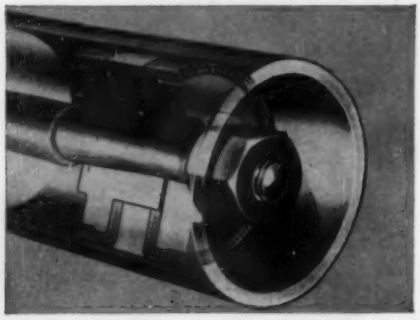
Frank Kruppe, Shank president (left) shows Hank Krueger of Standard Oil one of the pieces Shank Mfg. produces. Hank Krueger provides Shank plant with technical service on cutting fluids. Hank has the experience for this work. He's been doing it for six years. He has an engineering degree from Illinois Institute of Technology and has completed Standard's Sales Engineering School.

PUMCUPS

outlast ordinary packings

3 TO 1

- *in hydraulic and pneumatic mechanisms*
- *in reciprocating pumps*



With Darcova Pumcups...regardless of wear, pressure keeps Pumcups hugging cylinder wall.

Operating costs go down and efficiency goes up when Darcova Pumcups go in! Here's why:

- **Pumcups outlast other packings at least 3 to 1, based on actual reports from users**
- **Fluid slippage is virtually eliminated, because Pumcups operate at full efficiency throughout their entire life**
- **Maintenance costs are reduced, because you have fewer replacements, less downtime.**

Available in three textures—hard, medium and soft. Also in regular or 100% nylon composition. Size ranges from ¾" to 20". For *all* the facts on Darcova Pumcups, write for Bulletin 5903.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS

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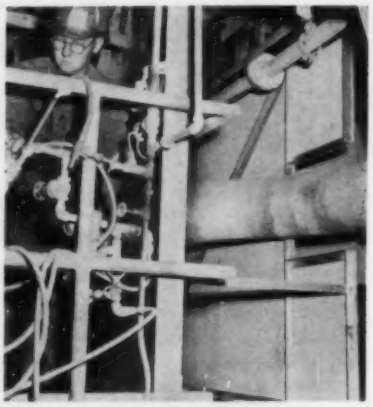
PLANT ENGINEERS' DIGEST

(Digest begins on page 40)



Section of heat barrier was easily removed to provide clearance for pipe.

lightweight, incombustible insulating board.

The problem was how to protect workmen operating controls six feet away from the main dryer. Rearrangement of machinery or controls would have been prohibitive in cost, so the heat barrier was erected in the narrow space available.

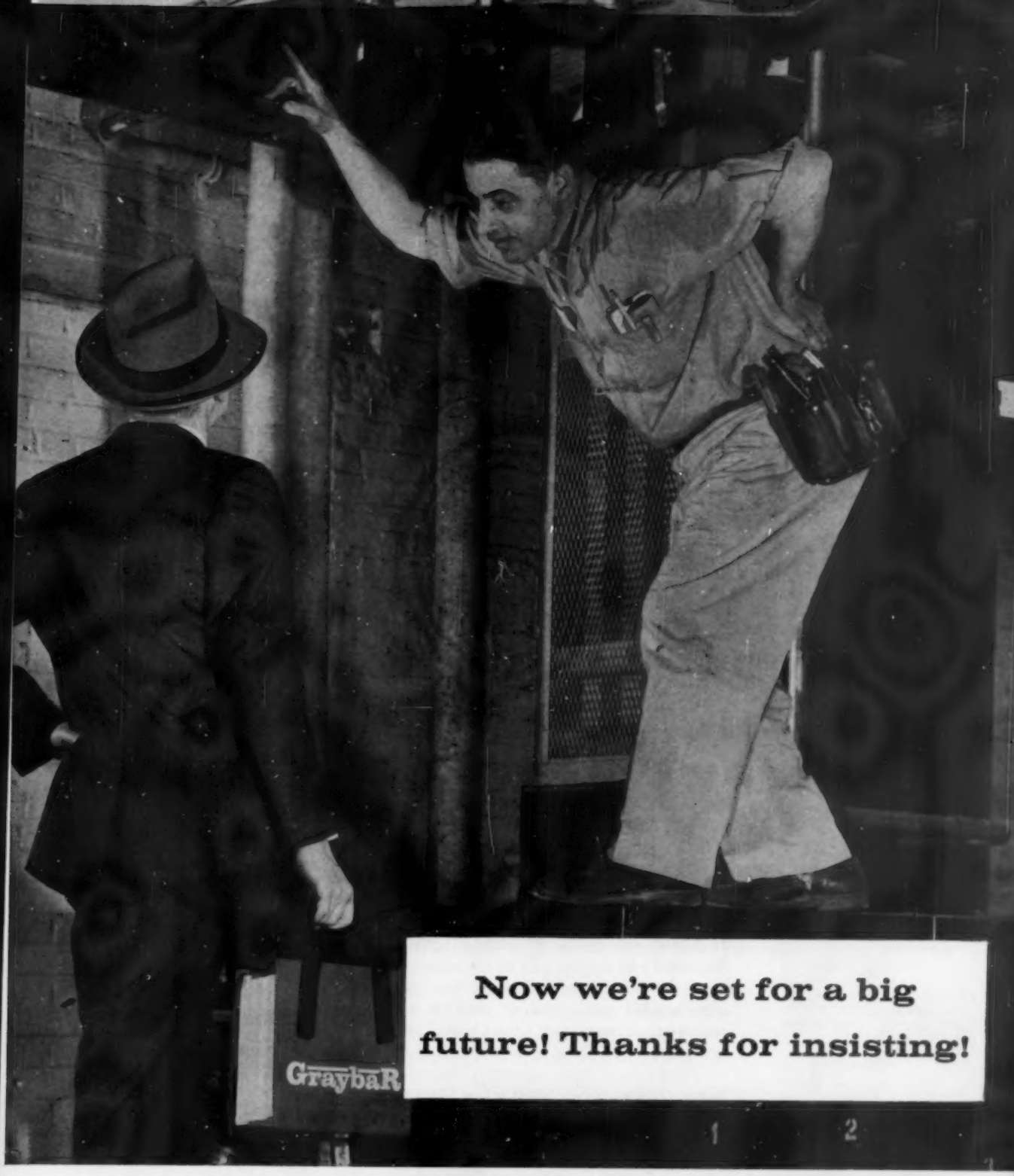
The insulating board was used because of its workability: it can be sawed, and nailed or fastened with screws. It does not absorb moisture, so is not affected by the high moisture content of the air coming from the dryer. *From a release of North American Asbestos Corp., Chicago, Illinois.*

High-Temperature Incineration Of Cyanide Wastes

A NEW SYSTEM for the disposal of cyanide wastes is in use at a manufacturing plant of an automobile producer. When operating at full capacity the installation will completely burn off 3600 lb per day of cyanide process wastes. Incineration is at high temperatures.

The complete system consists of a hopper to receive the cyanide waste material; a special grinder unit to prepare the cyanide wastes for "blending"; a blending tank in which the prepared cyanide wastes are mixed with soluble oil wastes; a pumping unit to deliver the "blended" wastes to the burner; a

For more facts circle 531 on Reply Card ——→



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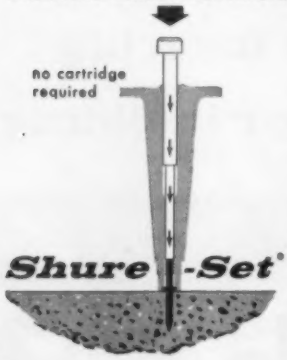
FOR QUICKER FASTENING INTO CONCRETE

UNIQUE POWER CONCENTRATION PRINCIPLE



The unique "hammer-in" principle of the Shure-Set tool enables you to set threaded studs, drive pins and wire loops into concrete without muss, fuss, or waste. It is a tremendous work-and time-saver... requires no pre-drilling, filling, plugging or cartridge... just place fastener in tool, position against work face, then a few hammer blows drive fastener right through this metal or wood into concrete.

Shure-Set is simple, efficient, economical and *ten times faster* than ordinary light fastening methods. And remember Ramset for heavy-duty fastening. For your dealer's name look under "Tools" in the Yellow Pages, or write us direct for information.

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OLIN MATHIESON Chemical Corporation — WINCHESTER-WESTERN DIVISION

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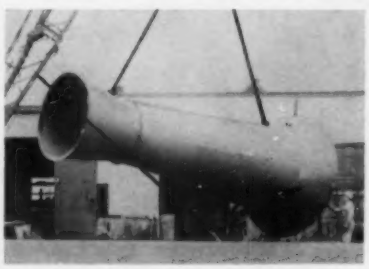
PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

heavy gage metal retort type burner unit employing a modified venturi, for high temperature incineration and a control room for periodic monitoring of system operation.

Cyanide wastes are delivered to the hopper by truck from the points of accumulation, which in this system are the heat treating plant and plating plant. From the hopper on, the system is fully automated. It is also fully annunciated with visible and audible signals in the control room for complete safety in the event of a component malfunction. The equipment is designed so that



Specially modified burner venturi assembly gives 4:1 air inspiration ratio.

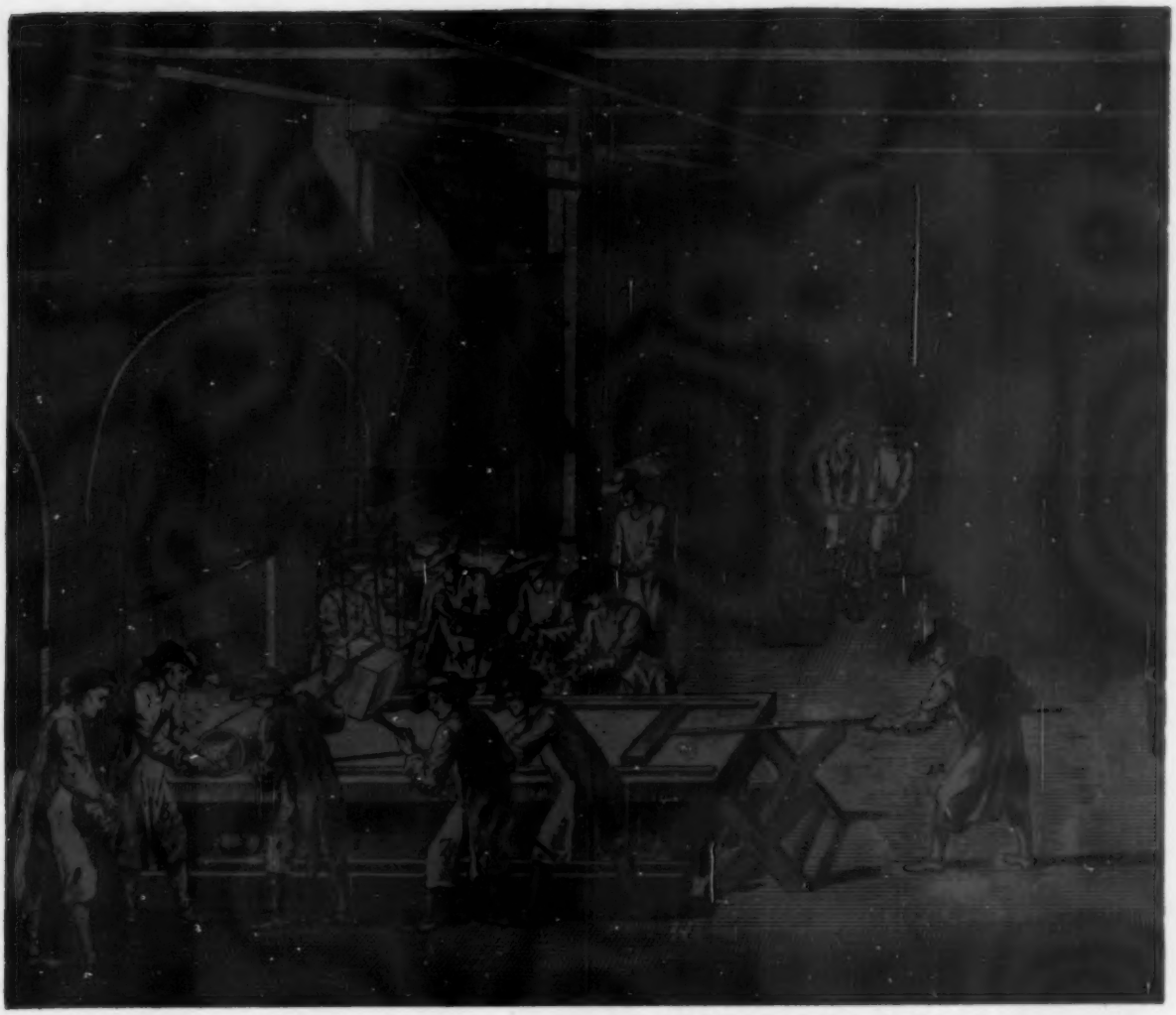
any malfunction which might constitute a danger to personnel or equipment will automatically shut down the system.

Provision is made for thorough purging of any or all parts of the system to permit the occasional inspection and maintenance required. *From a release of Prenco Manufacturing Corp., Royal Oak, Mich.*

Smokeless Metal Recovery

ELIMINATION OF SMOKE in the recovery of metal turnings has been achieved at Federated Metals Div., American Smelting and Refining Co., Los Angeles, Calif. by the installation of a system consisting of a rotary dryer and after-burner, crusher, magnetic separator and conveying equipment.

Water and cutting oil are removed from aluminum alloy chips in the turnings recovery process. If these oil-and water-bearing turnings are charged to the smelter as is, a serious fume problem results. Also, wet turnings can be explosive if they

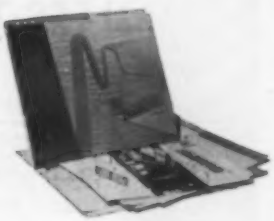


To Production Managers and Plant Engineers interested in increased efficiency and economy.

This 18th century glass manufacturer's dependence on men's muscles for materials handling is a far cry from today's methods. In modern plants skilled engineers have specified and now rely on Chainveyor overhead conveyor systems to reduce handling costs and speed production. Adaptable to an infinite variety of needs, Chainveyor has proven to be the answer to more profitable operation.

Chainveyor's amazing versatility lends itself to modernization of existing plant facilities as well as to new plant construction. Use of prefabricated standard parts permits easy installation, as well as fast and economical alteration when your handling needs change.

Power and free or straight power systems are specifically engineered for your needs. Chainveyor's "go anywhere" flexibility can provide fast, slow, or stop-and-go movement of loads. Many of today's critical production requirements are solved more efficiently and economically with Chainveyor.



Circle your Reader Service Card for quick, practical answers to your materials handling questions, and get Chainveyor's special Planning Folder which includes Illustrated Catalogs, Explanatory Diagrams, and Plant and Conveyor Planning Grids for preliminary layouts.

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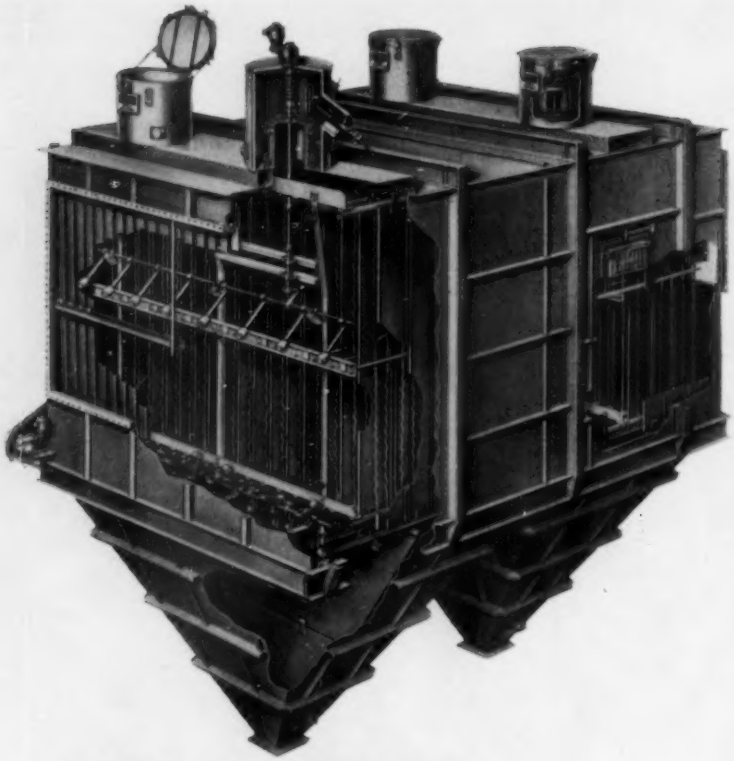

DECADE
OF OPERATION PROVES MAINTENANCE OF BUELL 'SF' PRECIPITATORS AVERAGE LESS THAN 2%

In 10 years of selling 'SF' electric precipitators, the number of replacement parts ordered from Buell has amounted to only 1.17% of the total sales! Even on emitting electrodes, usually the most vulnerable part of a precipitator, replacement has amounted to less than 1% of the original number installed. What do these extremely low percentages mean? Exceptionally low maintenance costs, for one thing, continuous high-efficiency operation, fewer shutdowns and process interruptions. Buell self-tensioned emitting Spiralectrodes eliminate vibration found in weight-tensioned wires. Buell's low maintenance precipitators will provide you with the most satisfactory operating results. They're backed by 25 years of experience in dust collection, with the practical know-how gained on hundreds of installations. Write for descriptive literature. The Buell Engineering Co., Inc., Dept. 14-B, 123 William St., N. Y. 38, N. Y. (Subsidiary: Ambuco Ltd, London, England)

EXPERTS AT DELIVERING EXTRA EFFICIENCY IN DUST RECOVERY SYSTEMS

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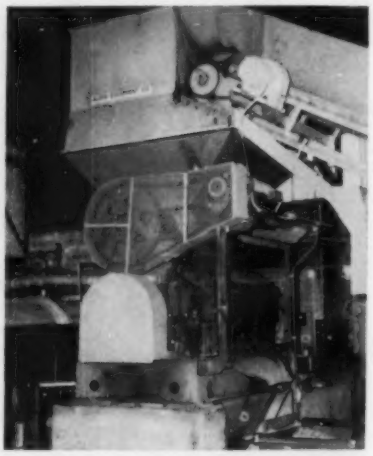
PLANT ENGINEERS' DIGEST

(Digest begins on page 40)



Conveyor delivers oil and water-soaked chips to crusher, thence to rotary dryer.

are pushed beneath the surface of molten aluminum in the smelter.

Wet turnings arriving at the plant in various sizes are first reduced in size by a crusher. This allows more complete drying and also provides for more effective magnetic separation of the iron later in the process.

The after-burner is the governing piece of equipment as far as capacity is concerned in the total processing operation. The oil on the turnings must be completely burned in the after-burner, otherwise fumes will result.

After the chips leave the dryer they drop into a bucket elevator from which they are discharged over a magnet to separate iron impurities. *From a release of Standard Steel Corp., Los Angeles, Calif.*

Plastic Tubing in Navy Shop

PLASTIC PRESSURE tubing for lubricating systems on machine tools, cranes, woodworking tools, hammers and presses is being used in place of metal tubing at the Boston Naval Shipyard.

Used with conventional fittings, it is proving more satisfactory than metal tubing as it does not break easily during vibration, does not kink and any stoppage of oil is visible through the tube wall. *From Bureau of Ships Journal, published by Navy Department Bureau of Ships, Washington, D.C.*

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DODGE HAS MORE PROVED BEARINGS THAN YOU HAVE BEARING PROBLEMS!

It pays to buy from a line of stock bearings—bearings that have been proved in thousands of installations similar to yours. You benefit by getting known dependability; and you get the important savings of high quality at production price.

PIN-POINT SELECTIVITY

Dodge has supplied mounted bearings to industry for over three-quarters of a century. Dodge bearings have always kept pace with improved production practices. Each new condition of service has been met by Dodge as it has arisen, with the result that the Dodge line contains mounted bearings to meet almost every service requirement with pinpoint accuracy.

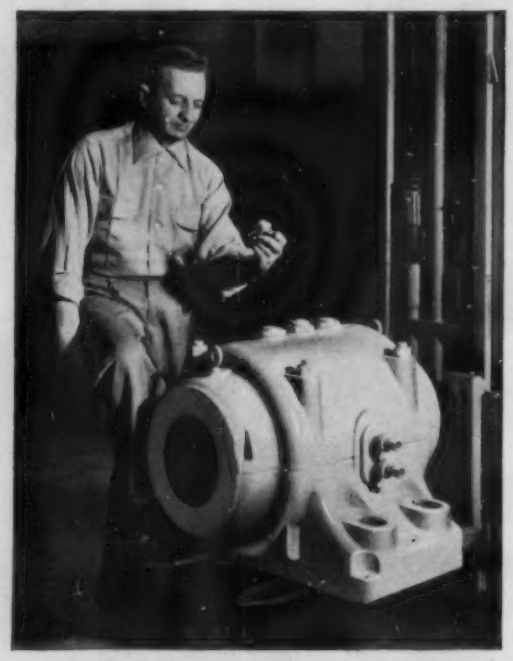
High load, high speed, excessive dust, moisture, corrosion, high or low temperatures, continuous operation—you name it!—such conditions and their combinations are met every day with Dodge bearings.

BROAD LINE—WIDELY DISTRIBUTED

In the great variety of mounted bearings developed by Dodge, you will most likely find the precise unit to fit your requirements ideally—without paying for features you do not need. And if your requirements call for several types of bearings, there is an advantage in having them of common design, such as Dodge offers.

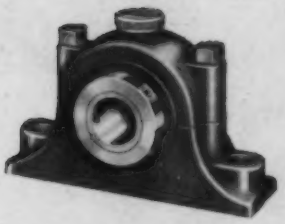
The Dodge line is probably broader than any other line of mounted bearings in America. And of special importance to machinery manufacturers, it is the most widely distributed line. There is always a Dodge bearing of the right type and size near at hand.

You can check this with your local Dodge Distributor. Ask him—or write us for the Dodge Bearing Bulletin.

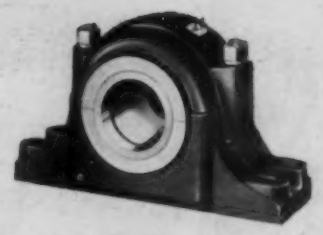


In addition to tapered roller, spherical roller and ball bearings, Dodge builds many types of sleeve bearings. Here is the "large and small" of the sleeve type bearings carried in stock—ranging from an 8-in. Sleevoil weighing over 1200 lbs. to a ½-in. solid journal bearing weighing 9 ounces.

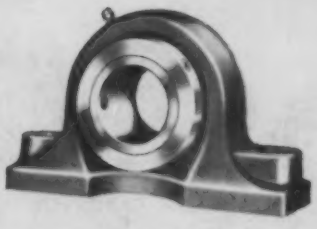
DODGE MANUFACTURING CORPORATION, 2700 Union Street, Mishawaka, Indiana



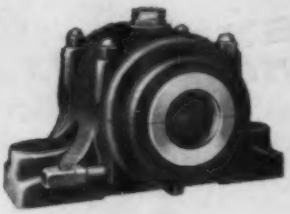
DODGE PILLOW BLOCKS WITH TIMKEN TAPERED ROLLER BEARINGS



DODGE SPHER-ALIGN PILLOW BLOCKS WITH SPHERICAL ROLLER BEARINGS



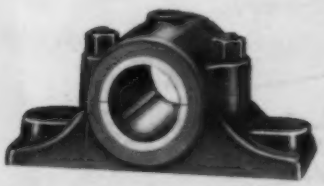
DODGE BALL BEARING PILLOW BLOCKS



DODGE SLEEVOIL PILLOW BLOCKS

DODGE BRONZOIL PILLOW BLOCKS

DODGE BRONZE BUSHED PILLOW BLOCKS



DODGE JOURNAL BEARINGS SOLID AND SPLIT

DODGE HEAVY RIGID PILLOW BLOCKS

FLANGE BEARINGS: HANGER BEARINGS: BEARING UNITS: TAKE-UPS

● **Dodge Pillow Blocks with Timken Tapered Roller Bearings.** America's quality pillow blocks. Assembled, lubricated, adjusted and sealed at the factory. 5 types for varying needs.

● **Dodge Spher-Align with Spherical Roller Bearings.** Rugged heavy duty, compact, inherently self-aligning. Exclusive Micro-Mount simplifies installation.

● **Dodge Ball Bearing Pillow Blocks.** Deep groove ball bearings with long inner races—high capacity. SL, SC and SCM models for light, normal and medium service respectively.

● **Dodge Sleevoil Pillow Blocks.** Ultra quality . . . extra long life . . . accessibility . . . *quiet*. Plain or water-cooled.

● **Dodge Bronzoil Pillow Blocks.** Efficient, low cost pillow blocks with self-oiling, capillary bronze bushings. Self-aligning. Large oil reservoirs.

● **Dodge Bronze Bushed Pillow Blocks.** Quiet fan and blower pillow blocks with two bronze bushings of high lead content mounted in one cast iron housing.

● **Dodge Journal Bearings — Solid and Split.** True running, dependable. Babbitted bearings with precision machined bores and faces. Finished bases.

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DODGE

of Mishawaka, Ind.

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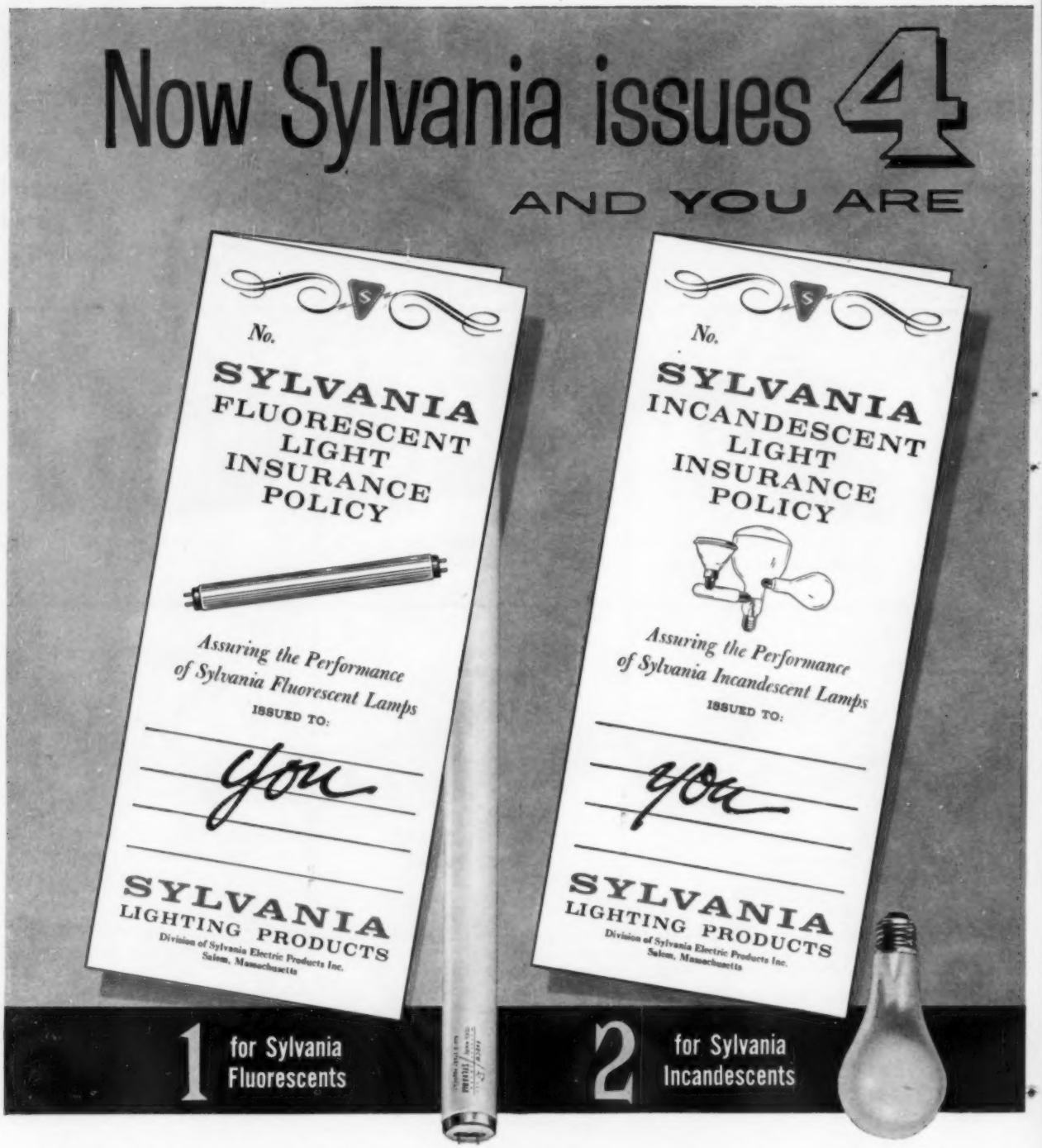
Now Sylvania issues 4

AND YOU ARE



How can Sylvania *do* a thing like this? Issue one insurance policy after another to *guarantee* that you get maximum lighting value . . . or your money back! Simple!

Because Sylvania in one lighting product after another *consistently* gives you the lowest TCL – Total Cost of Lighting – of any brand. (TCL equals cost of lamp or starter plus power plus maintenance.)

Because Sylvania lighting engineers *consistently* break the TCL barrier to bring you *more light* for less cost.

Because Sylvania—through its outstanding research and development—has been *consistently* out front in superior lighting.

There's just no question that Sylvania lighting products *do* provide top performance and will keep right on doing it! (You don't think we *want* to return your money, do you?)

Next time you buy Fluorescents, Incandescents, Mercury Vapor Lamps, or Starters, be sure your representative or supplier gives *you* your exclusive Sylvania Light Insurance Policy. Or write us: *Sylvania Lighting Products, a Division of Sylvania Electric Products Inc., Dept. 59, 60 Boston Street, Salem, Massachusetts. In Canada: Sylvania Electric (Canada) Ltd., P. O. Box 1190, Station "O," Montreal.*

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Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**

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HELPFUL WATER CONDITIONING DATA FROM BETZ

A MODERN APPROACH TO

The Dianodic method of corrosion control has revolutionized the treatment of open recirculating cooling water systems

CORROSION is undoubtedly the most widespread, and probably the most costly water caused difficulty that faces industry. The annual cost due to corrosion has been estimated at approximately six billion dollars. A large part of this loss occurs in cooling water systems of various types. The open recirculating cooling water system commonly used in most industries is typical. Prior to the advent of the Dianodic* method for corrosion control, chromate was the most commonly used inhibitor. Chromate concentrations in the range of 200 to 500 ppm often were employed to control corrosion. However, at this treatment level, pitting was not always adequately controlled and the cost of treatment was high.

The Dianodic method, an achievement of Betz research, was introduced approximately a decade ago, and employs a dual treatment of molecularly dehydrated phosphates and chromates over a selective pH range. This method produces effective control over pitting and tuberculation even with the relatively low treatment levels of 40-60 ppm. The superior corrosion protection secured and the low cost of treatment has encouraged wide use of the Dianodic method. Corrosion rates of 1 mil per year or less for steel are common with the pitting function completely prevented or very definitely stifled. Corrosion rates with copper and its alloys are even lower—often less than 0.3 mils per year. Figure 1 illustrates the results secured from an actual operating system.

Continued research at Betz Laboratories has permitted the development of many variations of the original Dianodic method to meet specific requirements for the individual cooling water system and to cope with the many variables that enter into the corrosion problem. The Dianodic methods include—Phosphate Dianodic — Zinc Dianodic — Fluoride Dianodic — Chromium Dianodic—as well as combinations of these methods.

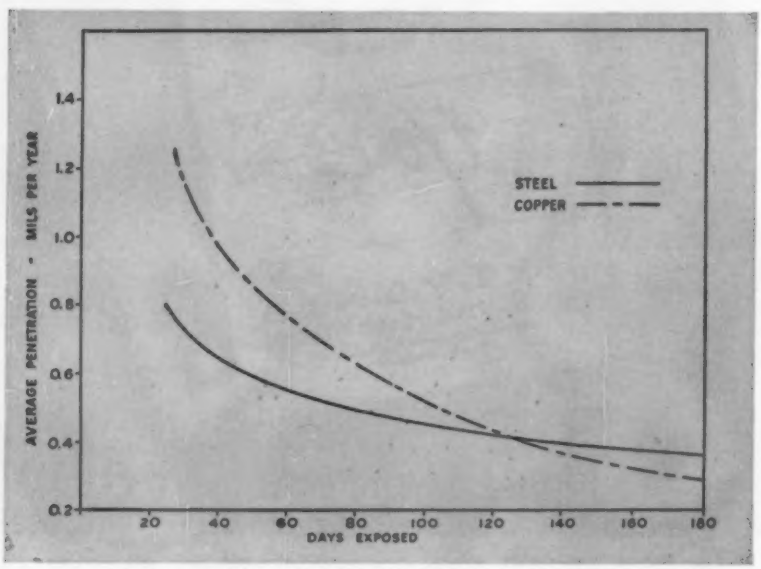


Figure 1—Corrosion results with Betz Dianodic method.

Phosphate Dianodic

The Phosphate Dianodic method which makes use of polyphosphate in combination with chromate over a controlled pH range, eliminates the pitting function that is produced by the individual components when used separately. Figures 2, 3 and 4 illustrate the control of pitting by the Dianodic method compared to phosphate and chromate when used separately. The shallow anodic areas that may develop with the use of this combination treatment have no appreciable depth and are rapidly rendered inactive. In many cases, even these shallow anodic areas do not develop.

Plant results with Phosphate Dianodic have been excellent. Treatment concentrations will vary with the individual operating conditions and may range between 30 and 100 ppm depending on water characteristics, temperature, cycles of concentration, retention time and other factors. Well established rules have been developed through years of experience over a wide range of conditions to permit the selection of the proper treatment levels, proper treatment ratios and pH range to assure maximum protection and the most economical cost for the individual system.

Zinc Dianodic

In spite of the wide coverage permitted by the Phosphate Dianodic method some limitations are encountered where calcium of the makeup water is high or the reversion of polyphosphate to the orthophosphate form is abnormal. Under these conditions it may not be possible to establish or maintain the most effective ratio of phosphate to chromate without encountering deposition of calcium phosphate. In these cases, Zinc Dianodic, another development of Betz research, can be used effectively. The superimposing of zinc on the phosphate-chromate combinations permits a greater latitude on phosphate levels or, at the same phosphate levels, improves corrosion protection. For example, when normal phosphate levels cannot be maintained due to some limiting factor, such as high calcium or a high reversion rate of the phosphate, phosphate level may be decreased and zinc superimposed. In this case, the zinc takes up the slack and acts as a cathodic inhibitor to stifle the corrosion reaction. With the introduction of Zinc Dianodic, even broader coverage is possible and this combination of zinc, phosphate and

[*Dianodic is a Betz trade name. The methods are covered by U. S. Patents 2,711,391; 2,900,222; 2,872,281; 2,848,299.]

chromate minimizes, if not eliminates, most limitations to use of the Dianodic method.

The Zinc Dianodic method is quite versatile and can be operated in the 'soluble range' or the 'coating range'. In the 'soluble range' or film forming range, pH and zinc values are set below the point where zinc phosphate will precipitate. Under these conditions no visible coating is formed except at points where the pH is elevated by local cell action. For example, if local cell action takes place, the area undergoing attack is the anode and the area surrounding the point of attack is the cathode. The cathodic reaction is:

$$\tfrac{1}{2}\ O_2 + H_2O + 2\ \text{electrons} = 2\ OH^-$$

The hydroxide thus formed is sufficient to elevate the pH and cause deposition of zinc phosphate which stifles the cathode reaction.

In the coating range, the zinc and pH are set above the pH of saturation of zinc phosphate which results in a coating formation over the entire system. After the desired coating is formed, the zinc and pH levels are adjusted downward so as to just maintain the coating intact and to repair the coating at any point where cell action may start. In both cases, it can be seen that the function of zinc is one of a cathodic inhibitor or barrier type treatment. Generally, however, the use of the 'coating range' is restricted to the treatment of once through systems.

In the control of corrosion, it is important that rapid film formation be accomplished to stifle the corrosion reactions. The use of Zinc Dianodic permits rapid film formation and is an excellent pretreatment for steel heat exchangers. Passivation of the steel surfaces can be accomplished in as little as two hours with treatment levels of 500 ppm or lower depending on temperature. The film thus formed can then be maintained with the normal treatment levels. Consequently, the fouling and high pressure drops that develop from the initial corrosion and tuberculation can be minimized or eliminated.

Fluoride Dianodic

Fluoride Dianodic, another development of Betz research, is designed to handle waters contaminated with aluminum. Surface supplies that are turbid must be clarified to remove suspended solids that would otherwise settle on heat transfer surfaces. It is common practice, to coagulate and settle surface supplies without the benefit of filtration when the water is used as makeup to open recirculating systems. The low turbidity from the modern type clarifier usually permits this practice. However, where aluminum is used as a coagulant and floc carryover takes place, fouling of the heat exchangers with aluminum deposits can result. Aluminum hydroxide and aluminum phosphate are most commonly encountered. The presence of aluminum interferes with the Phosphate Dianodic method by forming a soluble aluminum polyphosphate complex. The Fluoride Dianodic method makes use of the fluoride ion to preferentially complex the aluminum ion. The soluble complex thus formed acts dianodically with chromate and aids in avoiding fouling and stifling of corrosion.

Chromium Dianodic

The original applications of Phosphate Dianodic to many refinery cooling water systems uncovered many incidences where leakage from the process side was taking place. Where sour crudes are being processed, the leakage contaminates the cooling water with hydrogen sulfide, mercaptans and organic matter. Formerly, such leakage went undetected for appreciable periods of time and usually was discovered only after extensive damage was done to the system. With the application of Dianodic, the chromate component of the treatment is reduced by these contaminants to trivalent chromium and leakage is readily detected. Where possible the leakage should be corrected immediately to minimize the heavy corrosion load imparted by hydrogen sulfide. In many cases, immediate correction of the leakage is not possible and a suitable method of treatment in the presence of process leakage becomes necessary. This led to the development of Chromium Dianodic which makes use of chromium phosphate as a barrier type treatment during periods of leakage.

COOLING WATER TREATMENT

Figure 2—Chromate pits at 18 magnifications.

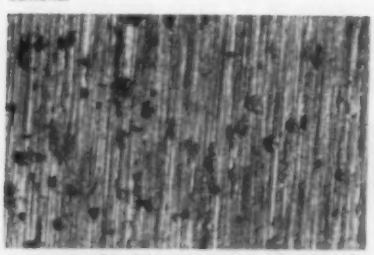


Figure 3—Phosphate pits at 18 magnifications.

Figure 4—Shallow anodic areas from the Dianodic method at 18 magnifications.

The Betz Dianodic methods are the most effective for open recirculating cooling water systems. Competitive studies have demonstrated this fact conclusively. The versatility of these methods makes them suitable for overcoming corrosion problems in practically every cooling water system—effectively and economically. A Betz Field Engineer will be pleased to discuss your cooling water problems and acquaint you with the savings that can be accomplished by the use of Betz Dianodic methods. A good time to call him in is *today!*

BETZ LABORATORIES, INC.
Gillingham & Worth Streets • Phila. 24, Pa.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

For more facts circle 538 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

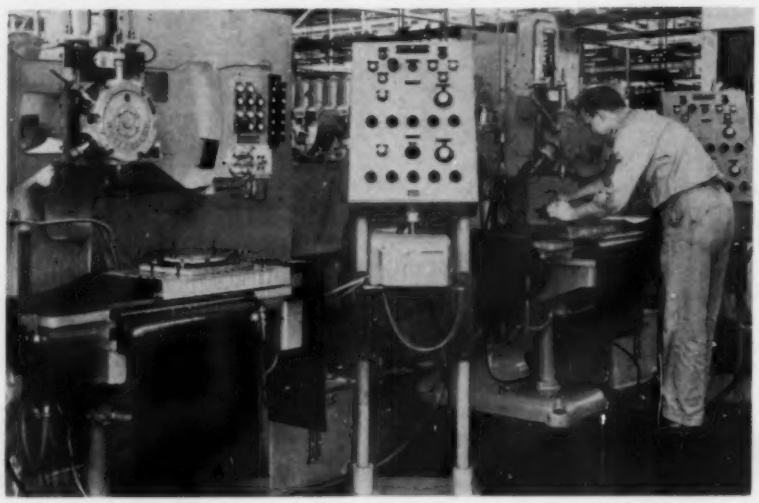
Automatic Tape-Controlled Drill Saves Labor and Tooling Costs

USING TWO numerically-controlled turret drills, Chandler Evans Corporation, West Hartford, Conn., has cut labor costs 50 per cent, reduced scrap losses 13 per cent and cut over-all tooling costs 40 per cent on drilling operations using these machines.

A manufacturer of aircraft engine accessories, Chandler Evans attributes the savings to the use of two recently installed six-spindle Burgmaster turret drills equipped with General Electric numerical positioning control systems.

Complex fixtures previously needed to hold work steady are no longer required. Using manually-controlled equipment, fixtures consisting of pre-drilled holes in a steel plate, supported above the work, held drill bushings. After each hole was drilled, the operator had to move the fixture, with the part attached, to the next drill and put in a different size drill bushing.

Now the only positioning plate needed is a simple, flat plate with two pinholes to hold the work to the table since the table moves with the work on the new machines.



Operator positions workpiece on drill table at right. Drill at left has completed operations and is waiting for new workpiece. Tape unit, center, controls drill.

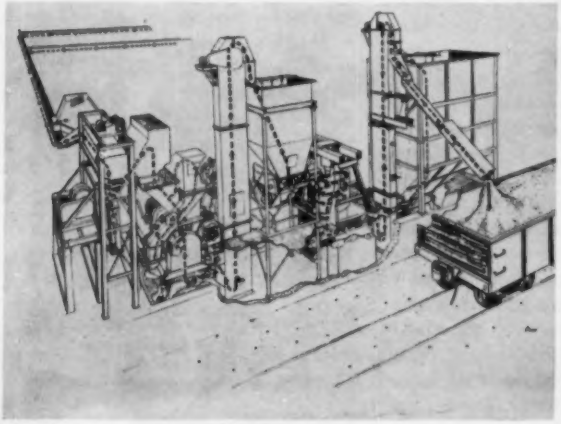
Cutting Oil Recovery System Pays For Itself in Two Years

PAYING for itself in just two years, a continuous metal chip handling and cutting oil recovery system has been installed at the new bearing plant of the Link-Belt Company in Indianapolis.

Known as the Link-Belt automatic chip handling system, this process continuously conveys metal turnings from two lines of automatic screw machines, crushes the turnings to a uniform size, extracts and sterilizes cutting oil from the chips, and stores and loads the oil-free chips into gondola railroad cars.

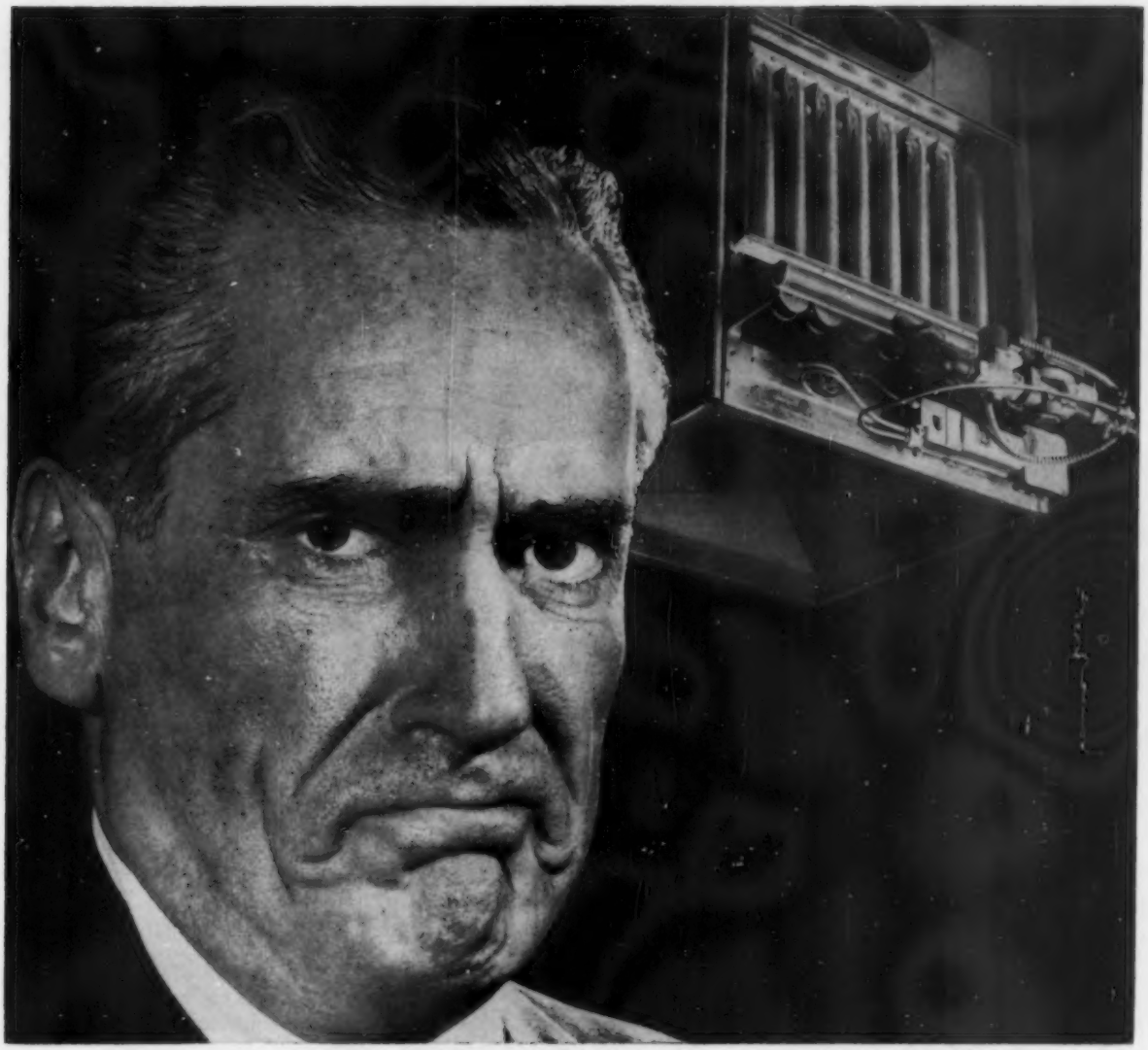
Oil-free turnings, which have been crushed to a uniform size bring a premium of $3 to $4 per ton over non-crushed, oily turnings. Reclamation of cutting oil from the chips

(Continued on page 60)



Flow diagram shows how chips pass through the crusher then to oil extraction unit and finally to railroad car.

Completely automatic in operation, this chip crushing and cutting oil extraction system will pay off in two years.



TOUGH BUYERS

DEMAND REZNOR STAINLESS STEEL DUCT FURNACES

BECAUSE THE HEAT EXCHANGER AND BURNERS CANNOT CORRODE!

The tough buyer looks to the future. He thinks about possible trouble-makers like corrosion in air conditioning, make-up or ventilation air systems. That's why so many of you insist on Reznor *stainless steel* duct furnaces: they *can't* corrode!

LOWER FUEL COSTS, TOO—You'll appreciate Reznor "extras," like the gas modulating valve that keeps heat even and fuel costs down. As discharge temperatures rise, the valve cuts gas input to 20% of rated capacity, then shuts off the supply completely.

CHECK THE "TOUGH BUYERS' LINE" You can select Reznor duct furnaces in capacities up to 300,000 Btu. Use them in multiples for greater heat requirements. Buy matching Reznor blowers.

For catalog and information, phone your nearby Reznor distributor, or write Reznor Manufacturing Company, Dept. 91B, Mercer, Pa.

For more facts circle 539 on Reply Card

THE HEATING WORLD IS FULL OF TOUGH BUYERS; THAT'S WHY REZNOR IS THE WORLD'S LARGEST SELLING DIRECT-FIRED HEATER!

REZNOR HEATERS

"THE TOUGH BUYERS' LINE"

OPERATION — PRODUCTION

(O and P begins on page 58)

reduces consumption by about one third.

As a rule of thumb, screw machine cutting oil costs about 33 cents a gallon, and even after the oil has drained from the conveyors, approximately one gallon of cutting oil can be extracted from each cubic foot of metal chips. Handling 144 cu ft of chips an hour, this saves 144 gallons of oil. In one hour this amounts to $47.52 and in eight hours $380.16

New Arbors Cut Tooling Time

REPAIR and replacement of arbors used in printing and coating machines at Atlas Collapsible Tube Company, Chicago, Illinois, formerly took 20 hours a week. By changing to arbors made of molybdenum-disulfide filled nylon, this time has been reduced to five hours.

Atlas forms and coats collapsible tubes used to package toothpaste, paints and foodstuffs. When the tube comes to the printer it is perfectly dry inside and out and is dead soft. The operator lifts the tube off a peg and slides it onto a printing arbor. The arbor rotates into the printing positon and is offset.

Printing arbors must maintain close tolerances to prevent damage to tubes.

Tolerances between the tube internal diameter and the diameter of the arbor are particularly important as the arbor must support the entire surface of the tube as it is being printed. As little as 0.005 in. wear on the arbor will cause a crease.

Since switching to arbors made of Nylatron GS bearing stock, manufactured by the Polymer Corporation, Reading, Pa., the arbors are lasting four to five times as long as previously used materials.

Ultrasonic Cleaning Saves Time

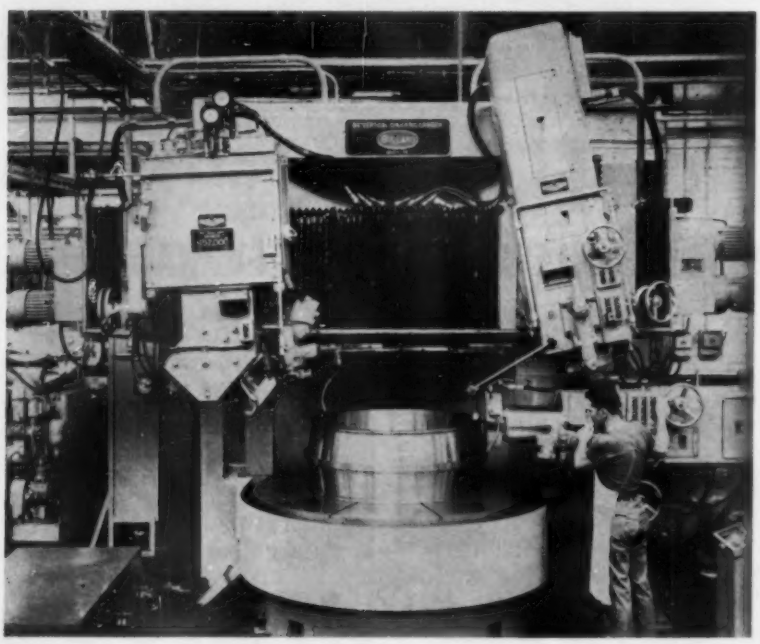
COMPLETE disassembly of meters and instruments for cleaning is not required with ultrasonic cleaning equipment used by the Union Electric Company, St. Louis, Mo. Meters need be only partially disassembled resulting in a substantial savings in time.

Cleaning is accomplished in three steps. The first step is an ultrasonic wash in L & R No-Foam cleaner for one to five minutes, depending upon dirt accumulation and type of soil. This is followed by an ultrasonic rinse in L & R Neutralizer for ½ to one minute to eliminate carry-over from the first stage. A switch in the generator circuit permits the output to be shifted easily from one tank to the other.

Finally the parts are soaked in

(Continued on page 62)

Three Heads on Vertical Chucking Grinder Permit Fast Setup, Reduce Idle Machine Time



Three grinding heads on vertical chucking grinder permit rapid changes of grinding angles without disturbing work. System reduces idle machine time.

WEIGHING over 100 tons, a huge vertical chucking grinder was delivered recently to the Timken Roller Bearing Company, Canton, Ohio. Designed for versatility, the grinder is equipped with three grinding heads and is capable of grinding bearings with an outside diameter of over seven feet.

Outside and inside diameters of cups and cones are ground with the right hand vertical head. Faces and ribs are ground by the side head and the left vertical head grinds the complete profile of thrust raceways at one setting. All three heads are mounted on precision hydraulically controlled slides.

Despite its great size, the grinder produces work with a total variation in finished dimensions as close as 0.0002 in. A master console controls the major functions of the machine. In addition, each of the three heads has its own controls. Cost of the machine and its installation was $192,000.

Vogt PACKAGED

FORGED STEEL FITTINGS, FLANGES and UNIONS

Complete product identification and data on label attached to carton.

Vogt modular designed cartons give added handling and storage space economies. All dimensions are in multiples of 3 inches.

for

MATERIAL HANDLING ECONOMY

1 Easy Inventory Identification

2 Easy Handling

3 Protection Against Damage

Handling and inventory costs are held to a minimum with Vogt modular packaged forged steel fittings, flanges, and unions. The small cartons, of restricted weight, are appreciated by the distributor and user alike for their easy handling and the protection given the products against damage.

The label attached to each carton completely describes and pictures the product and gives the quantity, size, end type, pressure, and catalog number.

Write for Folder PF-1 for complete data on quantities and weights of the items as packaged in various sizes of cartons.

Address Dept. 24A-FPLE.

HENRY VOGT MACHINE CO.

P.O. Box 1918 Louisville 1, Ky.

SALES OFFICES New York, Chicago, Cleveland, Dallas, Camden, N.J., St. Louis, Charleston, W.Va., Cincinnati

For more facts circle 540 on Reply Card

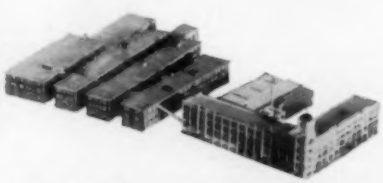
SOMETIMES IT'S CHEAPER TO LEAVE LIGHTS BURNING THAN TO TURN THEM OFF

The life of fluorescent lamps is affected, of course, by the number of times they're started. Assuming you had 10,000 40-watt preheat lamps in a room, by leaving them burning during a 15-minute lunch period, instead of turning them off, you'd save about $150 in a work year.

THERE ARE 7 DIFFERENT SHADES OF "WHITE" IN FLUORESCENT LAMPS

All seven basic "white" colors are needed to satisfy the color demands of a wide variety of commercial and industrial lighting users. The "cool" colors: Daylight, Cool White and DeLuxe Cool White are good for color matching. The "warm" colors: Warm White, DeLuxe Warm White and Soft White approximate the color of incandescent lamps and accentuate the reds. Plain "White" offers the best efficiency and is used where no particular color "atmosphere" is needed.

3,000 DIFFERENT TYPES OF LAMPS ALL PRODUCED IN 1 PLANT under 1 STANDARD OF QUALITY CONTROL



Champion has continuously produced top quality lamps since 1900. All research, development, manufacturing and test facilities are concentrated in one modern plant . . . all dedicated to provide you with light at lowest cost.

CHAMPION LAMP WORKS, Lynn, Massachusetts

CHAMPION INCANDESCENT-FLUORESCENT • *YOUR BEST BUY IN LAMPS*

For more facts circle 541 on Reply Card

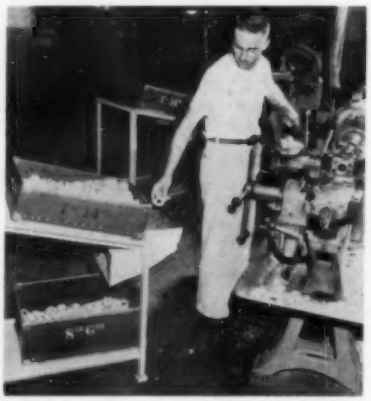
OPERATION—PRODUCTION

(O and P begins on page 58)

chlorothene to aid drying. No ultrasonic energy is required in this phase. During the ultrasonic cleaning, literally millions of tiny scrub brushes, created by the action of the sound waves on the liquid, reach into blind holes, threaded sections and undercuts to dislodge all contaminants.

The generator used by Union Electric operates on a frequency of 38 kc and this energy is converted by the transducers mounted on the tanks into mechanical energy at the same vibration frequency. The ultrasonic unit was furnished by Branson Ultrasonic Corporation, Stamford, Conn.

Trays Keep Stock Handy

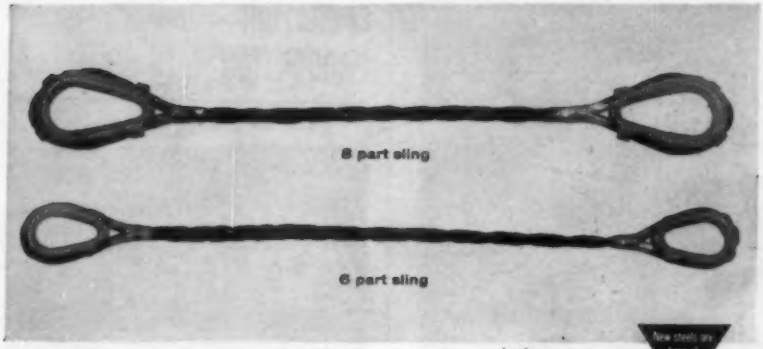


Motion-saving material handling trucks, equipped with delivery chutes and with tote trays furnished by National Vulcanized Fibre Co., contribute to increased production and lower costs by keeping "pick up" and "put away" operations within easy reach of worker.

Rotary Wheel Aids Production

REPLACING the standard assembly line work bench, a new rotary wheel is now used in assembling small missile electrical and electronic components at The Martin Company's Baltimore Division. The wheels can handle assemblies from two inches square on up to 14 by 18 in.

Each of 10 wheels now in operation has the capabilities of a conveyor belt with associated equipment, yet requires no more floor



Now Tuffy covers all the bases...

NEW HAND-BRAIDED SLINGS

are added to the UNION line

Union Wire Rope Corporation, makers of famous Tuffy patented, 9 part, machine-braided slings, now bring you top quality hand-braided slings. Meet the new members of the Tuffy team:

The hand-braided 6-part sling provides wide bearing area; greatest single-plane flexibility; least strength loss under severe bending; high cutting and twisting resistance.

The hand-braided 8-part sling provides extra wide bearing area, gives extra flexibility in all planes, low strength loss in bending, highest resistance to kinking and spinning.

Like the entire line of Tuffy slings and hoist lines, these new slings are the product of extensive field and laboratory research. They're specially designed for extra strength and flexibility. Tight end-braiding keeps component parts equal in length so that each rope carries its full share of the load.

In these new slings you'll get quality backed by Union Wire Rope experience and integrity. And you'll get a bigger dollar valve in longer service life with greater safety.

Your Tuffy Distributor Will Help You Save Money on Every Sling and Wire Rope Use

He's the man to see when you're replacing or adding slings, hoist lines and wire rope. He is set up for fast service, backed by his nearby Union Wire Rope branch office and warehouse staff and factory engineers. Get in touch with him.

Tuffy® Tips

—on safe use of
Slings and Hoist Lines

Professional Weight Lifters Work the Safety Angles

Here's a tip that could save an injury and absenteeism. The weight lifter's secret is proper leverage. Plus use of major leg muscles instead of back muscles. He never leans over to pick up the load. He squats down as near as possible to it. Lifting action comes from legs and thighs. If your workers must use muscles for some of the lighter lifting jobs, these points are worth remembering. But wherever possible—and always for heavy loads—use hoists and slings.

More Tips for Reducing Materials Handling Accidents

1. Teach your workers rated load factors. Warn them not to overload slings.
2. Use the right size hoist for every heavy lifting job. Don't put the load on muscles.
3. Show workers how to rig hoists properly and safely.
4. Inspect hoist load brakes often. Slipping or dragging brakes are a hazard.
5. Be sure to use the proper sling for the job. Don't assume that all slings made of wire rope are right for all lifting jobs.

FREE!
New Tuffy Sling Handbook

All about slings from A to Z, including types, dimensions and rated loads. Address **Union Wire Rope Corporation, 2272 Manchester Ave., Kansas City 26, Missouri.** Specialists in high carbon wire, wire rope, braided wire fabric, and stress relieved wire and strand.

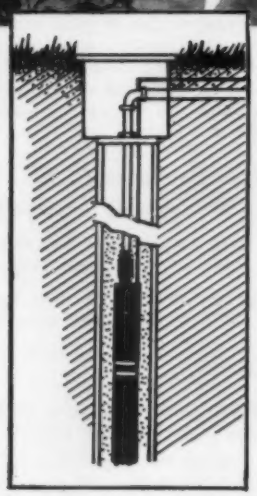
UNION Wire Rope

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products

For more facts circle 542 on Reply Card

Picture of a 2000 gpm SUMO Submersible water pump installation!



Yes! That's the beauty of a Sumo Submersible. No pump house or other protection is needed to safeguard the motor against freezing, dampness or tampering. The Sumo Submersible operates completely inside the well — pump and motor both — under water.

The idea is not new. It's not radical. It's just plain commonsense engineering as Sumo has proved after almost 50 years of specializing in the submersible pump field. The motor is coupled directly to the pump and forms a complete, compact unit that makes more efficient use of power . . . provides a neater, simpler installation . . . and assures long, troublefree operation.

Sumo Submersible Pumps come in a full range of sizes up to 125 hp with capacities to 3300 gpm. Consider their use for any deep well requirement whether it be commercial, industrial or municipal. They'll quickly pay for themselves.

Write for information. **Ask for literature on Sumo high-capacity pumps. For specific recommendations, state your water requirements and the depth of the well. Engineering assistance is always available without obligation.**

SUMO SUBMERSIBLE DRAINER PUMPS

For pumping water containing up to 20% solids. Ideal for dewatering or flooding or use in areas where internal combustion engine driven pumps present a hazard. Capacities up to 400 gpm. *Write for literature.*

SUMO PUMPS INC.

Dept. 2 P.O. Box 983 Stamford, Conn.

Warehouse Stocks: Stamford • Dallas • San Francisco

The Complete Line from 1/3 hp to 125 hp

For more facts circle 543 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 58)

Rotary wheel automatically advances work stations at pre-set time intervals.

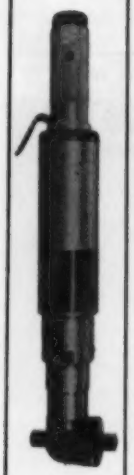
space than a standard work bench. Three work spaces for assembly personnel and 24 assembly positions are provided on each wheel. The individual operators work as a team, each operator accomplishing one-third of the work assigned to the particular wheel.

Operation is controlled by a Ledex stepping relay which is basically a power-operated rotary switch. Pneumatic pressure at 30 psi is used to move the wheel. The electrical control operates at 115 volts, drawing 400 watts.

In operation, a timing device is set for the proper stepping interval. At the end of this interval, the timer actuates a warning buzzer approximately three seconds before the stepping relay is energized. The rotary relay closes a circuit to the air solenoid, and air pressure advances the wheel to the next position. This sequence of operations continues automatically at the predetermined rate and without any further supervisory attention. These controls can be adjusted to regulate the time intervals per step from two to 180 minutes.

Press Brake Converts to Shear

CONVERTING a hydraulic press brake into a high production shear, through the use of a $3500 shearing attachment, saved investment in a ½-in. plate shear needed at the All-American Engineering Company, Wilmington, Delaware. The



Cleco air tools range in type and size from a small precision die grinder (length: 4⅞ ins. — weight: 12 ozs.) to custom-designed multiple spindle assembly units. This complete line includes Cleco's amazingly unique Clecomatic* screwdriver — nut-runners and nutsetters. The completely automatic air tools with positive torque control!

Cleco air tools are as quiet, as light weight, as economical, and as maintenance free as a tool can be and still do the job it was designed to with more efficiency than its rated capacity calls for. This is a true characteristic of Cleco Tools . . . their job performance usually exceeds your most critical demands.

To see how well a Cleco production-proved tool can do your job, call your Cleco® representative for a demonstration-tryout.

CLECO
AIR TOOLS

*TRADEMARK

A Division of REED ROLLER BIT COMPANY • P. O. BOX 2119 • HOUSTON 1, TEXAS

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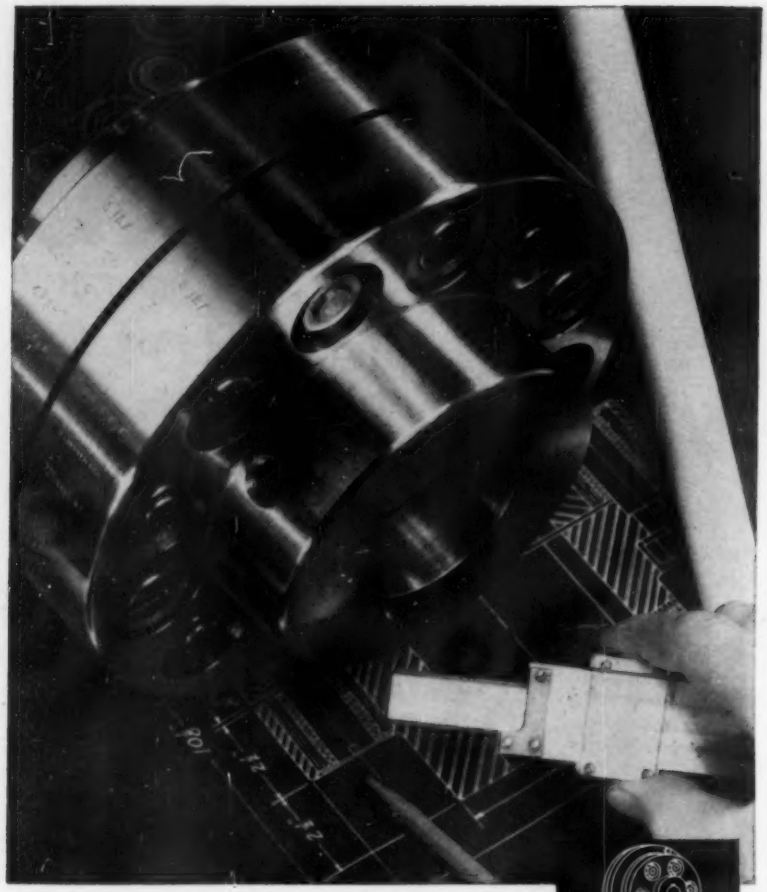


Never Underestimate the Economies of AJAX Flexible Couplings

The fact that *All the Horsepower goes through the coupling* is proof of its importance. In safeguarding performance . . . in reduced maintenance . . . in freedom from breakdowns and costly repairs, Ajax Flexible Couplings add to the reliability, reputation, and economy of the machines you build.

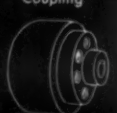
Ajax offers America's most complete line of bronze bushed, rubber cushioned and Dihedral gear type couplings available from stock for heavy machine and light duty service.

Write for complete engineering and selection data.

Ajax Type SP Shear Pin Coupling

Ajax Type BO Bolt-On Coupling

Ajax Type M Mill Motor Coupling



Ajax Type BD Brake Drum Coupling

AJAX

AJAX FLEXIBLE COUPLING CO. INC.
100 Portage Road, Westfield, N. Y.
Send catalog covering Flexible Couplings.

Name_____

Concern_____

Address_____

For more facts circle 545 on Reply Card

OPERATION—PRODUCTION

(O & P begins on page 58)

Attachment converts hydraulic press brake into a production plate shear.

attachment, manufactured by Pacific Industrial Manufacturing Company, Oakland, California, sheared 2200 quarter-inch thick manhole covers in 18 hours.

Currently operating 18 to 20 hours a week, cutting ⅛-in. stainless and up to ½-in. carbon steel plate, the attachment has been in use for six months without requiring knife resharpening. Unit was specially designed for use on a Pacific hydraulic press brake and can be installed or removed in a 15-minute operation.

18,000 Parts With Epoxy Dies?

CHECKER Motors Corporation, Kalamazoo, Mich., has drawn as many as 18,000 parts with a single epoxy resin based die. This is an outstanding accomplishment in the use of plastic dies which most production men consider in terms of shorter runs.

Sylvester J. Pingel, Manager of the tool die and plastic department at Checker, believes there is no theoretical limit to the number of draws possible with an epoxy die as long as downtime can be taken for repairs.

Epoxy resin, compounded by Ren Plastics, Inc., Lansing, Mich., is now used in dies made to draw wheel housings, hood hinges and floor pans. Among the advantages cited for epoxy resin dies are cost savings in labor and easier draws

than are possible with steel dies. For example, plastic dies can go from engineering into actual production in approximately one-third less time than steel dies.

With steel dies, costly patterns, machining and grinding are needed. This also means a large investment in labor to be certain that each die is exactly the correct shape. On the other hand, plastic dies are cast off a master in the desired shape without the need for costly machinery or labor.

In addition, the epoxy mixture can be cast by using only elementary hand tools to place and shape the plastic on the master. The entire job can be accomplished in practically any location in the plant because of the simplicity and lack of need for special machinery.

In addition, according to Mr. Pingel, it is 40 per cent easier to make a draw with an epoxy die than a steel die mainly because of the distribution factor. Less spot strain occurs in the steel panel drawn with the plastic die because of insulating factors and the ability to incorporate slip fillers in the plastic material.

Floor pan after removal from draw press. Both lower die and the press punch are faced with epoxy resin.

For example, by using an epoxy die Checker Motors is able to include a wheel well in the floor pan proper. The wheel well, which holds the spare tire in the trunk of the vehicle, has numerous sharp break lines and curves. These can be drawn in the floor pan in one pass due to the completely even distribution of metal on the plastic die. The wear factor is about the same as the original cast iron dies.

How to chop 13 weeks off a startup date

Hustling a new plant into operation, engineers at a western manufacturing company were badly pressed for time.

Needed almost immediately were two large heavy-duty mixers for fluids.

A long wait would mean soaring standby expense, lost income, a decisive edge for competition. And the usual manufacturing time for the mixers they needed was *16 weeks.*

One of the engineers phoned a LIGHTNIN Mixer representative. He, in turn, phoned the MIXCO factory. How soon could we ship two 50-horsepower LIGHTNIN Mixers, each equipped with a turbine impeller big as a dining-room table on a shaft 18 feet long, 4½ inches in diameter? And could we supply the lower shafts and impellers *with rubber covering?*

Six tons in 18 days

His call set off a swift, far-reaching chain reaction. Just 18 days later, we put nearly six tons of mixers aboard a fast truck—both units completed and shipped *13 weeks ahead of normal.*

Magic? No—just speed. We're set up for it because we build nothing but mixers. We build them fast when you need them fast—because we stock a tremendous range of mixer components and parts, in materials that match just about any process requirement.

And we have the manpower, the machines, and the know-how to give you the right answer to any fluid mixing problem in your plant. Rapidly.

For competent engineering help, call your LIGHTNIN Mixer representative (you'll find his name in Thomas' Register). Or write, wire, or phone us direct.

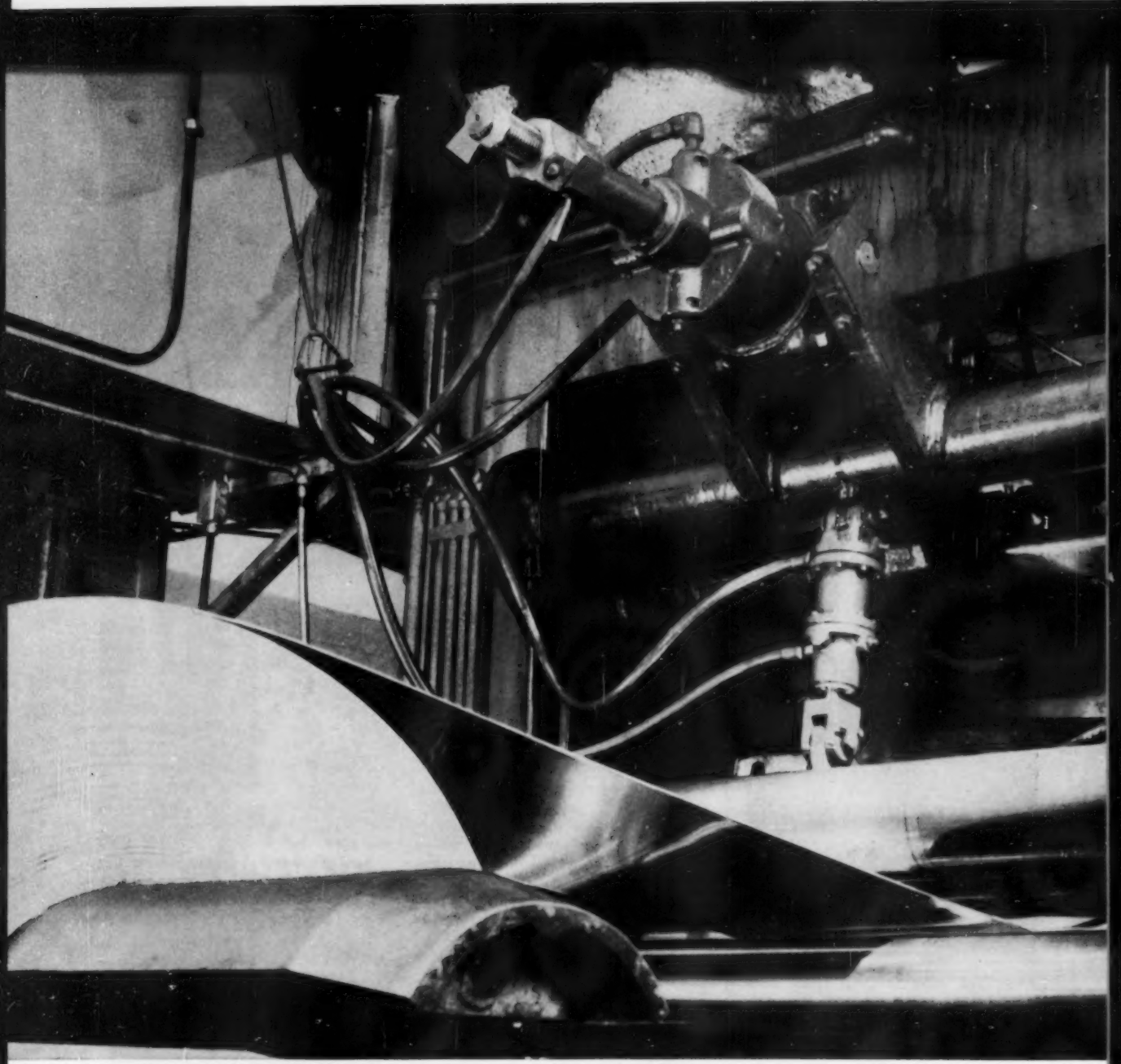
PAYOFF for engineer in a hurry: two 50-hp LIGHTNIN Mixers like this one—built in 18 days.

Lightnin' Mixers

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 144-b Mt. Read Blvd., Rochester 3, N.Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.



Custom rolling sheet aluminum at Sheet Aluminum Corporation, Jackson, Michigan. All hydraulic systems in the plant are filled with Gulf Harmony oil. Photo shows processed aluminum being wound on tension reel at delivery end of mill.

Cut costs with versatile Gulf Harmony® for plant lubrication

GULF MAKES THINGS

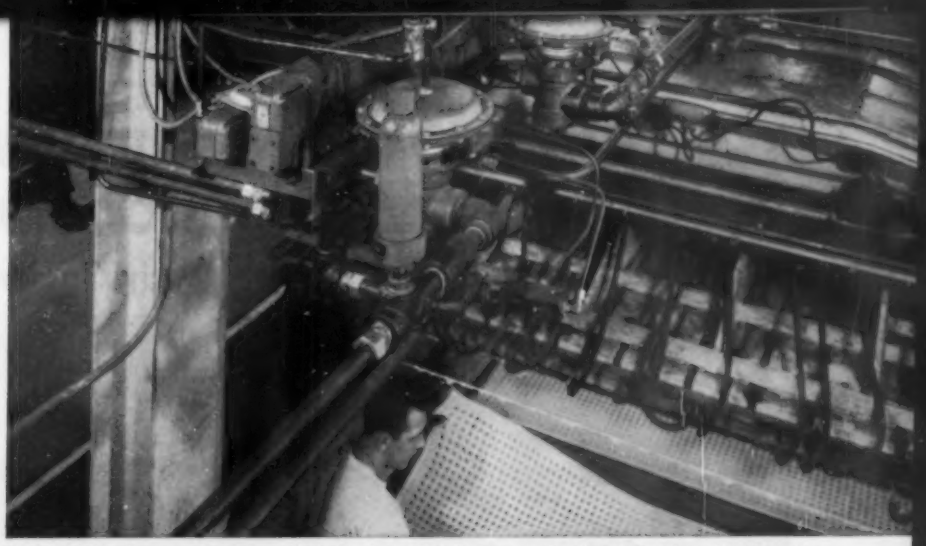
Using numerous special purpose lubricants? Here's relief. You can meet virtually every oil requirement in your plant—including fluid power for hydraulic systems—with Gulf Harmony.

In central lubricating systems, hydraulic systems, in the lubrication of dryer roll bearings, air compressors, blowers, machine tools, electric motors and a host of other applications—Gulf Harmony can save you money and simplify your oil problems.

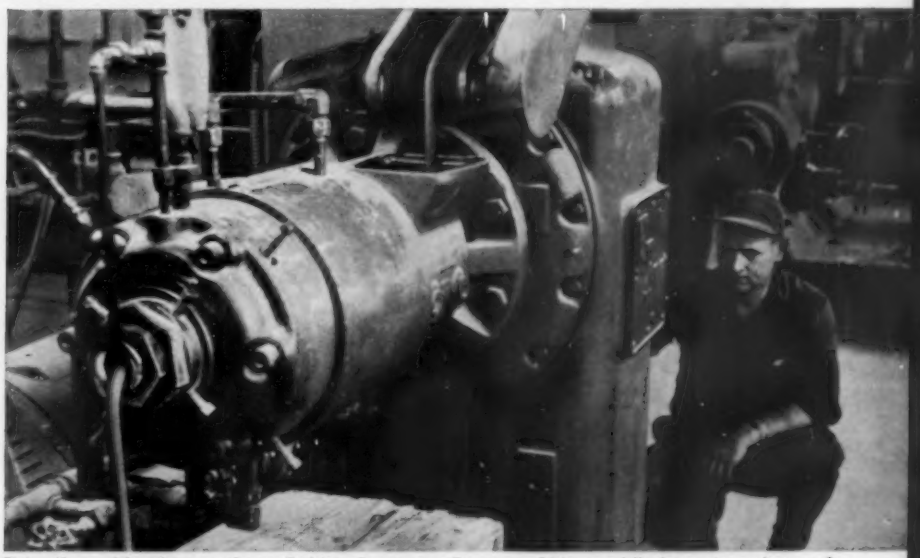
The unusually high oxidation resistance of Gulf Harmony assures longer life—for both machine and lubricant—and freedom from harmful sludge deposits.

In addition, Gulf Harmony maintains its original viscosity and color stability for exceptionally long periods.

A patented anti-foam agent in Gulf Harmony prevents objectionable foaming. And there is a strong anti-corrosion additive that protects against rust. Gulf Harmony oil performs remarkably well in bearings exposed



Moulding Texfoam mattresses at the B. F. Goodrich Sponge Products Division, Shelton, Connecticut. Here, through hydraulic equipment as shown in upper foreground, Gulf Harmony supplies fluid power for 125 moulding presses.



Extruding rubber hose at Swan Rubber Company, Bucyrus, Ohio, world's largest producer of garden hose. The many precision gears in the speed reduction units of the extruder shown here operate in a bath of Gulf Harmony oil.

and hydraulic systems . . . see how

RUN BETTER!

to high ambient temperatures and humid atmospheres.

You name the application—and your Gulf Sales Engineer will gladly recommend the proper grade of Gulf Harmony. He'll also show you how this versatile oil can help cut your maintenance costs and simplify your lubricant storage and handling.

If you have a lubrication problem at your plant, we invite you to see how Gulf makes things run better. Just call your nearest Gulf office, or mail the coupon.

GULF

GULF OIL CORPORATION
Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.

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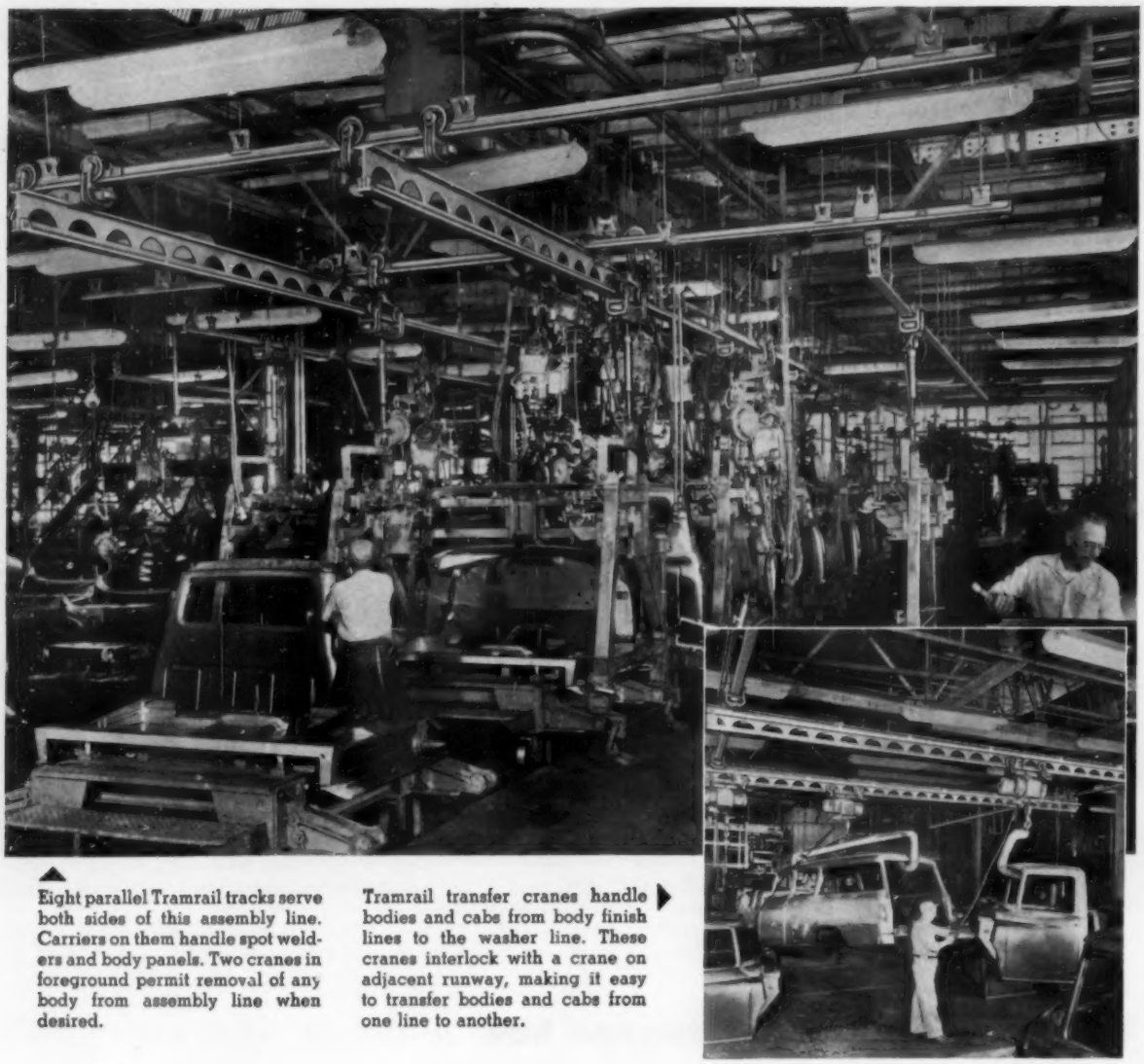
CLEVELAND TRAMRAIL *DEPENDABILITY* FULLY PROVEN BY TRUCK MANUFACTURER

In Continuous Service for Nearly Quarter Century



Eight parallel Tramrail tracks serve both sides of this assembly line. Carriers on them handle spot welders and body panels. Two cranes in foreground permit removal of any body from assembly line when desired.

Tramrail transfer cranes handle bodies and cabs from body finish lines to the washer line. These cranes interlock with a crane on adjacent runway, making it easy to transfer bodies and cabs from one line to another.

IN a truck manufacturing plant every minute counts. Slow-downs or stoppages in any department cannot be tolerated because the operation of each directly affects the others. Here is where the quality of equipment really shows up.

Cleveland Tramrail has been in use for almost a quarter century throughout the large plant of a prominent truck manufacturer for a wide range of materials handling work. It has kept apace with production requirements.

The superior design and exacting standards to which Cleveland Tramrail is built, assures outstanding performance in the manufacture of trucks or other equipment. Cleveland Tramrail equipment can be depended upon.

WRITE FOR FREE COPY of Engineering and Data Booklet No. 2008. Packed with valuable information. Profusely illustrated.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 7550 E. 290 ST. • WICKLIFFE, OHIO

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For more facts circle 549 on Reply Card ——→

New from American-Standard
Industrial Division

Air-Lift† for Industrial Plants

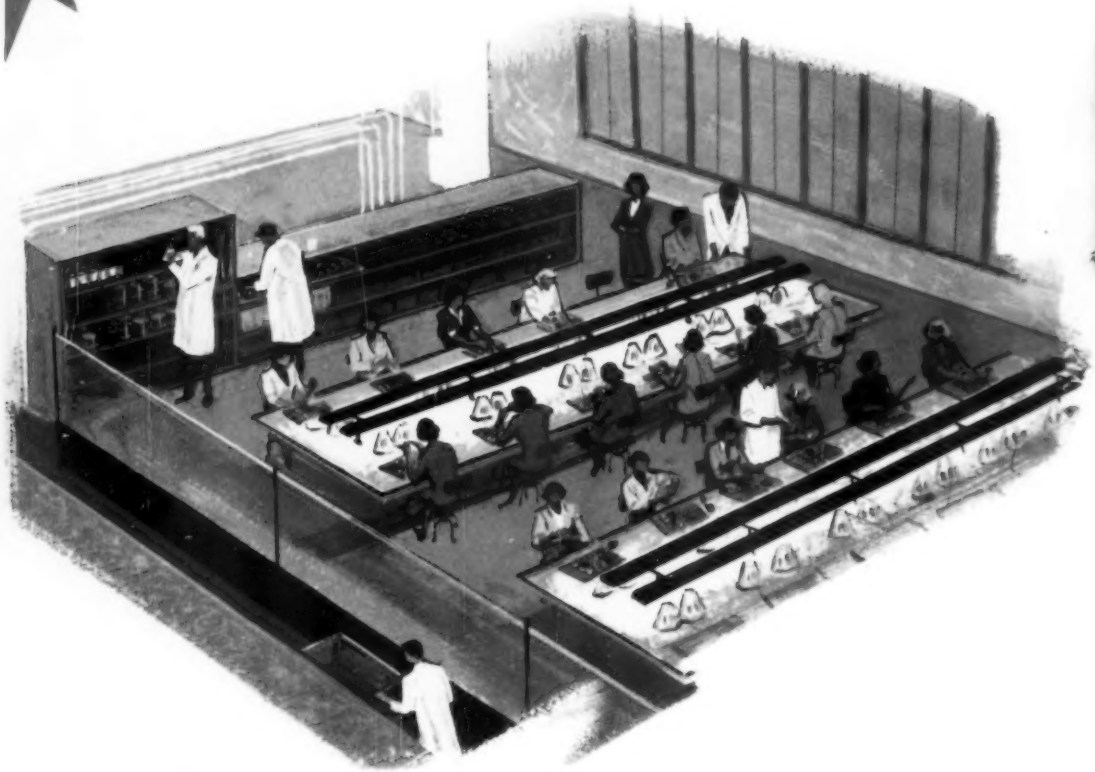
Air-Lift is a new concept of coordinated products and services from American-Standard Industrial Division. Its purpose is to help you lift the productivity and profitability of your business through better control of inplant environment. Air-Lift offers you one-source responsibility for quality and performance in air-conditioning, air-handling, heating, and air-pollution-control equipment that is designed, engineered, and manufactured to work together.

To see how Air-Lift can benefit your plant . . .

← LIFT THE FLAP

†Service-mark of American-Standard

American-Standard Industrial Division **AIR-LIFT IN ACTION**

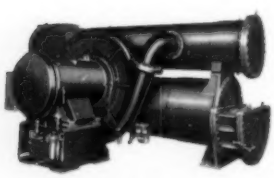


Greater efficiency in
MANUFACTURING

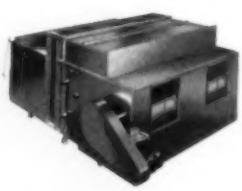
It takes an experien

Select by the piece, buy by the package

AIR CONDITIONING



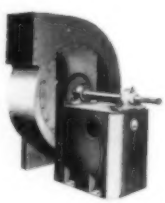
Centrifugal refrigeration units for central systems.



Central-station units for plants and office buildings.

AIR HANDLING

Centrifugal fans for supply or exhaust in duct systems.



Industrial fans for handling air, gases, and materials.

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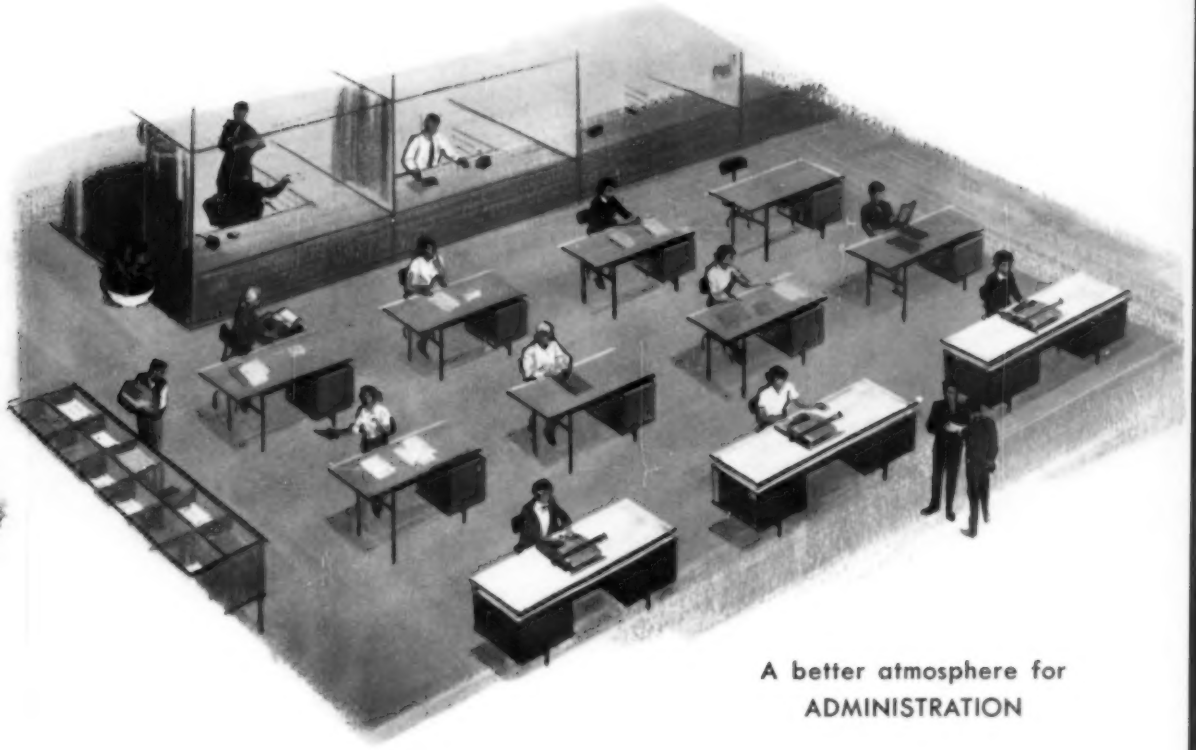


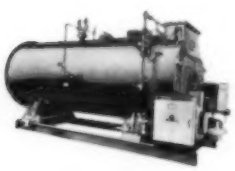
A better atmosphere for
ADMINISTRATION

enced team to make indoor climate behave

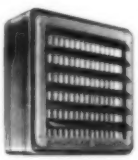
Here's how we fit in . . .

American-Standard Industrial Division product specialists work right along with your plant operating managers, your architect, consulting engineer, and contractor. They have the equipment to do the most efficient job in every phase of inplant environment control . . . from air-conditioning, heating, makeup air and exhaust to dust collection and process air handling. And they have the experience and know-how to help you from the planning stage to final installation. Coordinated products and services give you a better atmosphere for administration, improve efficiency in manufacturing . . . give your entire plant an AIR-LIFT.

HEATING



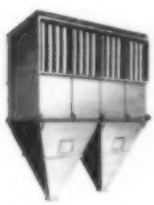
Boilers and package units for heat and process steam.



Vertical and horizontal unit heaters for steam, hot water.

AIR POLLUTION CONTROL

Dust collectors tailored to the type and amount of dust.



Fly ash collectors to control emission and recover fly ash.

One-source responsibility

The heart of American-Standard Industrial Division's Air-Lift Service

Better control of inplant environment requires many different kinds of equipment . . . equipment which must work together as a system.

By selecting *all* the major components from American-Standard* Industrial Division, you draw from the combined American Blower, Ross, and Kewanee product lines. You get equipment designed, engineered, and manufactured to work together. You get *one-source* responsibility for quality and performance—an important benefit of American-Standard Industrial Division's Air-Lift Service. Air-Lift helps you lift the productivity and profitability of your business.

Offices in all principal cities are staffed by product specialists to help you with equipment selection and on-the-job problems. Give the office near you a call. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO. EXPORT DIVISION, AMERICAN-STANDARD, NEW YORK CITY.

Products designed, engineered, and manufactured to work together

AIR CONDITIONING

Centrifugal refrigerating machines Central station units • Fancoil units • Self-contained air conditioners • Package water chillers Multi-zone air conditioners Sprayed coil dehumidifiers • Heating and cooling coils • Air washers

AIR HANDLING

Industrial fans with wheel types for handling air, gases, materials, and shavings • Centrifugal, propeller, tubeaxial, and vaneaxial fans • Utility sets • Power roof ventilators • Centrifugal compressors • Specialized fans, blowers

HEATING

Firebox, scotch-type steel boilers and package units for heat, process steam • Vertical and horizontal unit heaters for steam or hot water Heavy-duty heating coils • Industrial unit heaters • Heating and ventilating units • Cabinet heaters

AIR POLLUTION CONTROL

Dust collectors and fly ash collectors for eliminating dust and recovering fly ash • Cyclone-type centrifugal dust collectors • Disposal systems • Tubular-type centrifugal collectors • Package units • Electrostatic precipitators

POWER TRANSMISSION

Gyrol® Fluid Drives for stepless, adjustable-speed control of driven machinery • Complete range of sizes, 1 hp thru 12,000 hp • All provide extremely smooth pickup of the load, affording maximum protection for motor and machine

HEAT TRANSFER

Standard and engineered heat exchangers, condensers, and feedwater heaters for every requirement Oil and gas coolers • Refrigeration condensers and coolers • Instantaneous water heaters for service-water, booster, convertor duty

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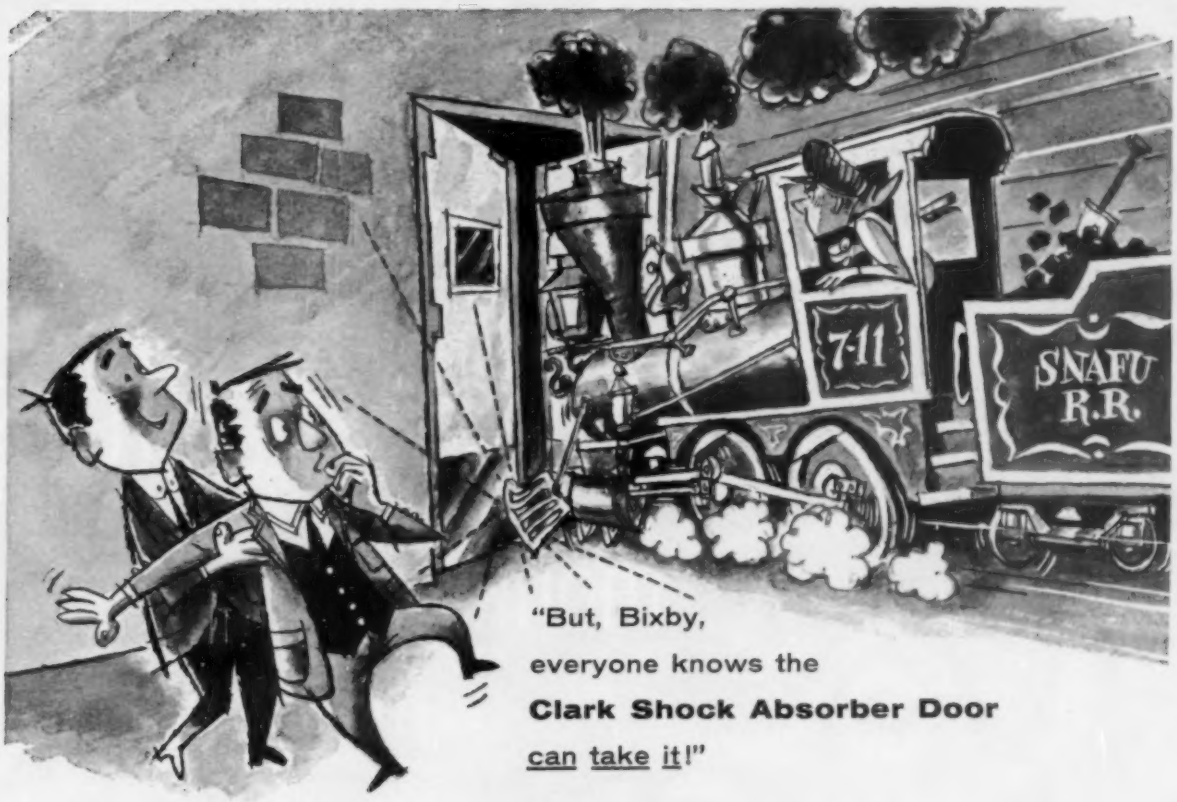


"But, Bixby,
everyone knows the
Clark Shock Absorber Door
can take it!"

The BUMPER Takes the Shock – *Not the DOOR!*

At last there's a material handling Door that works **for** you, not **against** you.

Exclusive Urethane-Cushioned Bumpers on the lightweight, rigid Shock Absorber Door take impact in stride. There's no stress or strain at the flexible hinges, no warping, nothing to go out of whack — no "time-outs" for repair.

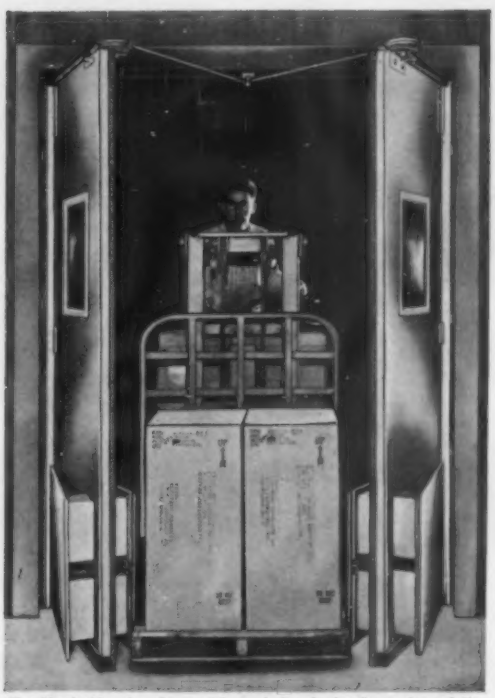
Maintains Temperature Controls

Guaranteed Spring Return closes the Door tightly after each opening. Flexible Neoprene Seals at all edges prevent loss of heat or cold (as the case may be). They keep air temperatures exactly where you want them.

Surprisingly low in cost, the Shock Absorber Door comes in one complete, easy-to-install unit. It may be your solution to slowdowns and bottlenecks. Write today for price lists, specifications and full information. State size of opening.

Special-Formula Urethane-Filled Bumpers absorb shocks.

CLARK DOOR
COMPANY, INC. *(since 1878)*
507 Hunterdon St.
Newark 8, N. J.



The Shock Absorber Door withstands hundreds of openings daily at this Associated Grocers Co. warehouse in New Hampshire. Specified by Wm. Varker, Construction Consultant.

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Westinghouse develops new motor starters with 6 "monkey proof" safety features

Westinghouse NEMA 12 Life-Line combination starters end unauthorized tampering, offer greater safety and convenience to service personnel

To order simply contact your local Westinghouse representative or distributor now, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

YOU CAN BE SURE...IF IT'S **Westinghouse**

Watch "Westinghouse Lucille Ball-Desi Arnaz Shows" CBS TV

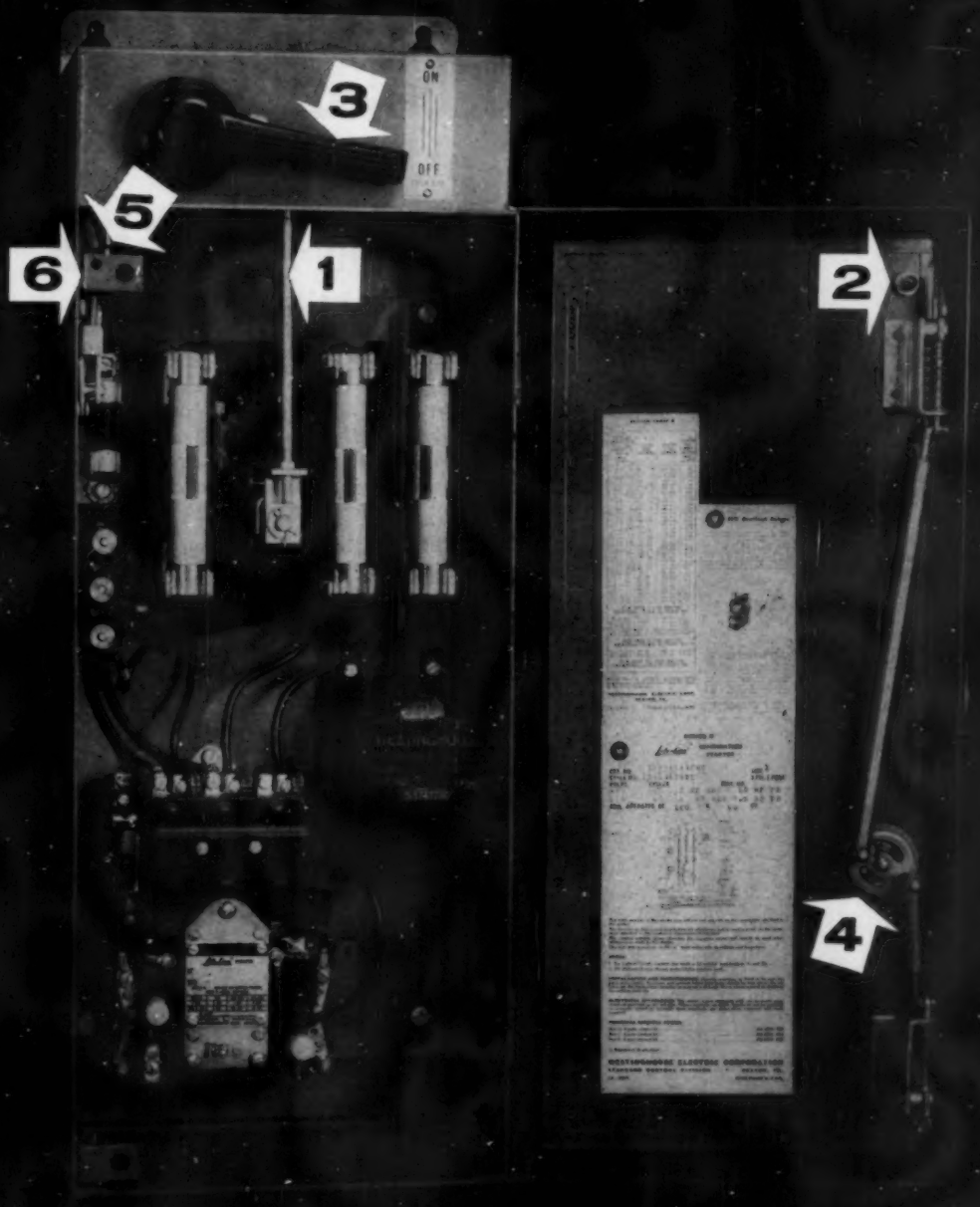
Check these 6 great new safety "firsts"...

1 2 3

SAFE—You always know whether power is on or off because ON-OFF handle is permanently attached to disconnect...even when door is open.

SAFE—Positive gasket seal keeps out oil and dust. An interlock requires that door must be tightly sealed before handle can be moved to ON position.

SAFE—Even when you're out of sight, padlocking ON-OFF handle prevents any operation of disconnect regardless of whether door is *OPEN* or *CLOSED*.



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SAFE—Discourages tampering by unauthorized personnel. Tool required to open door.

SAFE—Accidental operation of disconnect impossible when door is open. Disconnect interlock must be deliberately voided to operate ON-OFF handle.

SAFE—Interlock prevents door from being opened when switch is on. ON-OFF handle must be in OFF position to open door.

J-30306

NOW.....even more efficient!

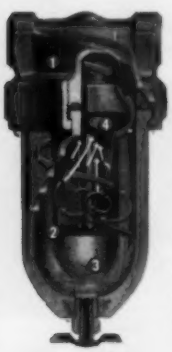
Watts "TORNADO ACTION" filter with new Automatic Drain

Designers — and users — of air-operated tools and equipment specify Watts filters because their superior filtering action and moisture-removing qualities have proved their efficiency. Now, with Watts' new automatic drain, you can have *truly automatic* filtering, too.

Watts "HIGH EFFICIENCY" filters remove condensate from air lines so effectively that draining of the bowl, in some instances, becomes necessary as many as three times daily. To meet the demand for labor-saving components, Watts has designed the "Auto Drain", a completely automatic drain filter which incorporates all the features found in the standard Series 602, 603 filters.

By use of the pilot principle, efficient and dependable removal of foreign particles and liquid condensate is attained. When liquid rises, the float admits air to the pilot valve chamber, opening a scavenger valve and allowing the trapped liquid and impurities to be blown out the drain opening.

Available in full range of sizes; ¼" through 1". Transparent bowls for pressures up to 150 PSI; metal bowls for pressures to 250 PSI.



How Watts "Tornado Action" removes condensate and dirt from air lines

Curved inlet ❶ directs incoming air in downward helical pattern. Larger impurities and condensate are "thrown out" by centrifugal action, collecting on bowl sides and spiraling downward past baffle ❷ into quiet chamber for draining-off. Baffle traps sediment in quiet chamber ❸ and allows only dry air centrifugally cleaned of larger impurities to reach filter element ❹ where finer particles are filtered out.

WATTS

FILTERS • REGULATORS • LUBRICATORS

YOUR SAFE SPECIFICATION

WATTS REGULATOR COMPANY, 10 Embankment Road, Lawrence, Mass.

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Write for free technical catalog:

Charts, diagrams, and performance data enable you to specify the correct Watts pneumatic equipment.

COURT DECISIONS —a summary of legal findings of interest to the plant engineer

Prepared by Albert Woodruff Gray

Influencing Employee's Discharge

SUIT WAS BROUGHT by an employee against two officers of the corporation on the ground that they had brought about his discharge. He had not been hired for a definite period and his employment could be ended any time.

The New York court said: "The rule is well settled that under an employment at will, termination of the employment—with or without reason —gives neither the employer nor the employee any cause of action against the other.

"The rule has been extended to relieve third persons from liability for maliciously causing an employer to cancel the employment where, as here, such employment was at will. Stated differently, a lawful act such as the cancellation of this man's employment, at will, is not made actionable because it was induced by malicious statements made by others to the employer." Court brief 185 N.Y.S. 2d 287, March 5, 1959.

Overtime Wages on Hourly Basis

SUITS FOR OVERTIME wages under the Fair Labor Standards Act were brought by 10 employees against an engineering firm in southern California. In its defense, the employer contended that not only was the work performed by these employees not engineering work in interstate commerce but that the employees themselves were supervisory or professional employees and not within the overtime provisions of this statute.

Among other features serving to bring these employees within these wage and hour provisions of the statute was the computation of their wages on an hourly basis.

The Federal court referred to provisions of the Code of Federal Regulations and the definition of executive and professional employees.

"The requirement is not fulfilled by the earnings of a person who is paid on an hourly basis," it is there provided. "The shortest pay period which can properly be understood to be appropriate for a person employed in an executive capacity is obviously a weekly pay period and hourly paid employees should not be entitled to the exemption. The executive status in and of itself connotes at least a tenure implied by a weekly pay period as the very minimum."

The Federal court, in sustaining a judgment against the engineering firm for time and a half for overtime, said: "This particular regulation pertaining to 'salary basis' compensation must be taken to mean precisely what it says and that is a reasonable exercise of authority delegated to the Administration." To this was added, "The report expressly points out that employees on hourly basis cannot be considered in an exclusive capacity." Court brief 265 Fed. 2d 251, April 7, 1959.

Patent Infringement Suit Delay

SUIT FOR patent infringement of a device for breaking and separating oils to be refined, was brought by the patent owner nine years after the first infringement had occurred. Sustaining a judgment dismissing this infringement action on the ground that the patent owner had forfeited his right, by this delay, to the protection of the patent against infringement, the Federal court said:

"Equity frowns upon stale demands. She will not aid one who has slept upon his rights. She turns her back upon a litigant who has been guilty of unreasonable delay in filing suit. In a line of decisions extending farther back than a century our Supreme Court has recognized this equitable doctrine as being grounded upon considerations of the peace of society and of public convenience." Court brief 86 Fed. 2nd 600, November 30, 1936.

Refusal to Sell

A DEALER IN Massachusetts was notified by an automobile radio manufacturer that his radios would no longer be available to him as a distributor.

The dealer brought suit against the manufacturer on the ground that such a refusal was a violation of the Federal antitrust laws. In the court action, it was contended that this manufacturer together with two competitors of this dealer had conspired to restrict the dealer's trade and competition.

In asking for a dismissal of this action, the manufacturer rested its argument on the famous decision of the Supreme Court in which it had been said: "In the absence of any purpose to create or maintain a monopoly the (Sherman) Act does not restrict the long recognized right of a trader or manufacturer engaged in an entirely private business, freely to exercise his own independent discretion as to parties with whom he will deal."

Answer of the court to this argument was that here was not merely a refusal to deal but that the refusal was in furtherance of a conspiracy between this manufacturer and the competitors of this dealer to restrict the dealer's competition.

"It destroys the dealer's ability to compete for customers for the manufacturer's products and thus drives it out of business as a dealer in these products. Hence, it tends to interfere with the natural flow of interstate commerce and violates the Act even though there may be no public injury in the sense that destruction of the dealer's business may make little difference to the economy as a whole." Court brief 173 F.S. 396, May 24, 1959.

Dealership Contract

A CONTRACT between a manufacturer of farm machinery and a Texas dealer provided that both the manufacturer and the dealer might sell the goods covered by this contract to federal, state or local governments and departments and educational institutions. Further, that if such sales were made by the company there should be no liability on the manufacturer to the dealer for any compensation.

In a lawsuit between the dealer and this manufacturer, the dealer maintained that since, under this provision, the company was permitted to sell to these purchasers it was excluded by implication from the right to sell to others than those specifically mentioned.

This interpretation the court refused to accept. "Such an interpretation," it said, "would read an implied covenant into an express contract which under the circumstances, here present, may not be done." Court brief 324 S.W.2d 578, May 1, 1959.

Nuisance Charge

A SUIT WAS recently brought by the city of Erie, Pennsylvania, against an oil refining company. It was contended that the proposed construction by that company of an 1,800,000 gallon gasoline storage tank was a nuisance and that the construction should be prohibited by the court.

The property where the tank was

COURT DECISIONS

to be built was zoned for heavy industry and 13 oil and gasoline tanks were already located in the neighborhood.

In its refusal of the injunction, the Pennsylvania court said: "In this industrial age persons living in or near a commercial or industrial area must subject their personal desires, comforts and the depreciated value of their property to the public good.

"Oil and gasoline are vitally important to the American people as individuals. And even more important, they are vitally necessary for our country's welfare and economic progress.

"In order to be readily available for use they have to be stored somewhere. If properly stored they can be safely stored. In an industrial or commercial neighborhood oil or gasoline storage tanks are not a nuisance in themselves." Court brief 150 Atl. 2d 351, April 29, 1959.

Contributory Negligence

AN ELECTRICIAN with 25 years of experience was employed by a farmer and operator of a cotton gin in South Carolina for the installation of a new lighting system around the cotton gin. The farmer had told the electrician that old wires, which it was necessary for him to remove, carried no current and had not been used for years.

He was standing on a ladder to remove these wires and received a shock from one of the wires and fell 20 ft to the ground. The workman brought action against the farmer. Recovery was refused by the South Carolina court. The court said:

"One of the rules of the law of master and servant is that by entering the service of his employer an employee assumes the risks ordinarily incident to the service he has engaged to perform and that injury resulting to him from such risks will give rise to no common law right of recovery against the employer." Court brief 109 S.E.2d 12, June 8, 1959.

Employee Discrimination

AFTER A Pennsylvania employer had become bankrupt he reestablished his business in New Jersey. With the collapse of his business in Pennsylvania, his employees in that state had been dismissed. With the revival of his business in New Jersey, new employees were engaged.

Subsequently, the Pennsylvania local union, of which his former employees were members, persuaded the employer to reinstate them and discharge those whom he had later hired in New Jersey. When he did so, a complaint of unfair labor practice was filed by one of the discharged employees with the labor board.

The charge against the employer was sustained by the Board with the statement: "An employer can discriminate without being guilty of an unfair labor practice so long as he does not thereby intend to encourage or discourage union membership or activity.

"But it is recognized that proof of certain types of discrimination is sufficient proof of intent to encourage or discourage union activity. This is but an application of the common law rule that a man is held to intend the foreseeable consequences of his conduct.

"Sometimes an employer cannot avoid discriminating among his employees. For instance, business conditions frequently dictate a contraction in the size of a labor force. When an employer lays off some employees while retaining others in such a situation, he is acting discriminatively.

"If his criterion for selecting those to be laid off is intended to discourage or encourage union activity he commits an unfair labor practice. But if his criterion is, for example, individual employee efficiency or seniority, then something more would be necessary for showing an unfair labor practice.

"It is possible that the criterion adopted, though alone reasonable enough, may have the foreseeable result of affecting union activity, in which case the employer commits an unfair labor practice." Court brief 265 Fed. 2d 855, April 7, 1959.

Design Patent Invalid

SUIT WAS recently brought for the infringement of a design patent of a fluorescent lighting fixture. The design shown in this patent was a plain unornamented geometrical housing for electric lighting equipment.

In defense to the charge of infringement, it was contended that the patent itself was invalid and as a consequence there could be no infringement. Under the patent law it is provided, "Whoever invents any new, original and ornamental design for an article of manufacture, may obtain a patent therefore subject to the conditions and requirements of this title."

This defense of an invalid patent had been sustained by the lower court and the inventor had appealed. The Federal appellate court, in affirming the decision, said:

"A design patent in order to be valid must disclose a design that is new, original and ornamental, unanticipated and inventive in character and beyond the skill of the ordinary designer or draftsman. Originality imparts something of uniqueness and character—something more than mere novelty.

"A design patent cannot be obtained to protect a mechanical function or cover an article whose configuration affects its utility alone. The design of the fluorescent lighting fixture in suit represents merely the expected skill of designers and mechanics working in the art and does not represent design invention." Court brief 267 Fed. 2d 111, April 28, 1959.

Union Liability

A NEW JERSEY steel construction company prescribed a grievance procedure with its employees for the settlement of disputes, with final resort to arbitration if the dispute was not settled through such procedure. Pending arbitration, the matters in dispute were held in abeyance.

Also in this contract was a "no strike" clause in which the union agreed not to strike except upon refusal of the company to arbitrate.

An automatic electric welding machine had been installed in this plant. An employee directed by the plant superintendent to operate the machine refused unless he was assigned a helper. The superintendent told him that if he refused to operate the machine, there would be no more work for him. The employee "punched out" and within two hours all the union employees had left the plant.

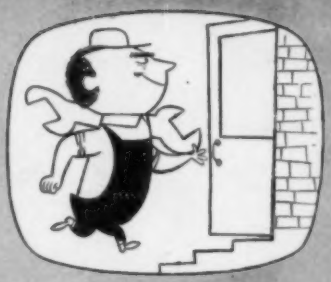
Damages were awarded the company in its action against the union for calling the strike. In making that award, the Federal court said: "The contract recognized that the company had the exclusive right to change the equipment and to assign work to be performed and to discharge employees for proper cause. This employee was directed to operate the new welding machine without a helper. This, the employee by direction of the union agent, refused to do.

"His refusal constituted proper cause for his discharge. If the employee and his union considered the discharge without proper cause, the grievance and arbitration provisions of the contract were available for the invocation. Instead of abiding by these terms of the agreement, the union called the strike without affording any opportunity to request arbitration. The union must bear the sole responsibility for its breach and assume the consequences thereof." Court brief 178 F.S. 354, April 16, 1959.

4-Way® Safety Plate Presents

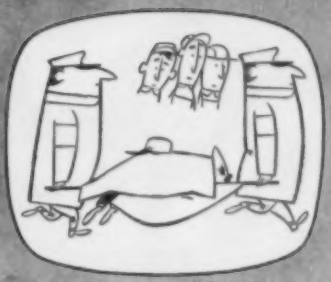
A GRIPPING TALE OF LIFE ON SKID ROW

THE BIG SLIP!

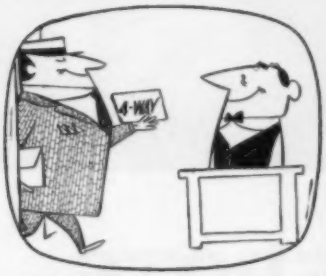


Enter our star—Benny Bandsaw. Great guy on the production line. Mr. America to his wife and kids. Every day Benny and millions just like him, go to work on Skid Row.

Watch it, Benny—look out! Wow! Too bad. On Skid Row, what *on the surface* appears to be a safe place to work, may turn out to be a surprise for Benny and his buddies.



And thus, another Skid Row tragedy. Our hero gets the slip and the result is *lost* time....*lost* production....*lost* safety records . . . and *lost* money.

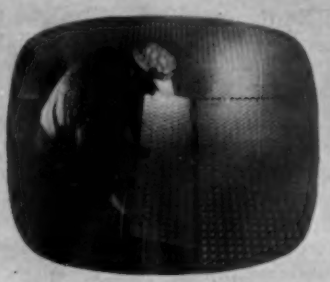


But...help is at hand. Enter 4-Way salesman....J. W. Goodheart...genial representative for versatile, slip-resistant 4-WAY Safety Plate!

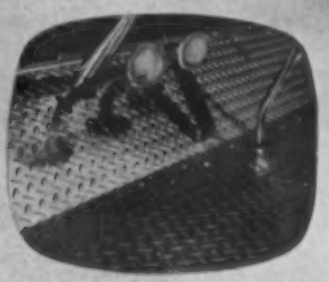
Solution? Yes, Sir! Industrial plants, stores, offices, schools, hospitals, all over the USA, use 4-WAY . . . find it SAFE, STRONG, EASY TO CLEAN, ATTRACTIVE!

What's more, 4-WAY can be flame cut, sheared, sawed, drilled, punched, welded, formed . . . it is simple and EASY TO FABRICATE!

FIRESAFE, too! 4-WAY is an added safeguard for your people, your plant, your equipment and stock . . . and my how those insurance men appreciate it.



When it comes to installation and maintenance, no special tools or skill is required. Inland 4-WAY Safety Plate is one of the most ECONOMICAL materials you can use!



And don't overlook the advantages of super-strong, mighty-attractive, 4-WAY on the products you make. It can add an important merchandising feature that will help boost sales.

AMERICAN STEEL WAREHOUSE ASS'N

INLAND

4-WAY® SAFETY PLATE

Available at your Steel Service Center or from Inland in a wide variety of patterns and sizes.

INLAND STEEL COMPANY

30 West Monroe Street • Chicago 3, Illinois

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(X) MARKS THE SPOTS
where 4 valves are replaced by 1...

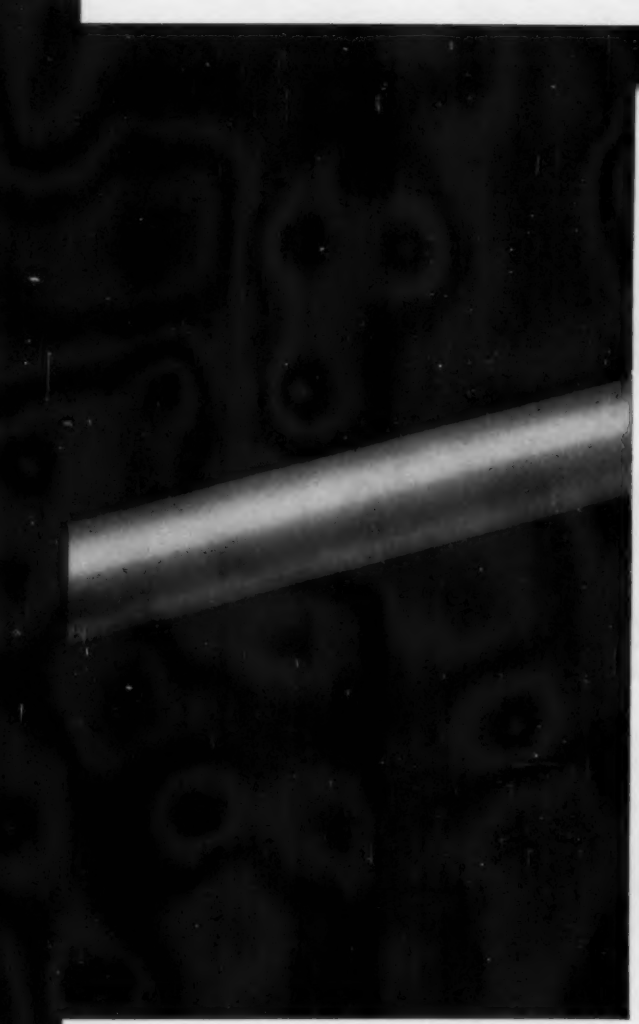
. . . And that one valve is a Rockwell-Nordstrom Multiport lubricated plug valve. Above, it is controlling flow in *four* directions—a multiple job only this type of valve can do.

This could mean big savings in your plant, plus more efficient traffic control of everything you flow through pipe. For instance: A large sugar refinery had trouble efficiently routing slurry to process units. A Rockwell field engineer recommended Multiport valves, since *one* Multiport does the work of *three* or *four* ordinary valves. With fewer valves and simplified piping and fittings, the new installation quickly paid for itself by eliminating costly flow control errors and improving quality. And since Rockwell-Nordstrom is the most *complete* line of lubricated plug valves, the Rockwell field engineer was able to make a number of other valve suggestions for improving flow control, preventing waste, and reducing valve maintenance.

There are literally hundreds of ways Rockwell field engineers are helping manufacturing and processing plants save time, money, and materials through better measurement and control methods. The experience of the world's largest manufacturer of valves, meters, regulators, and other measurement and control products, can pay off for you, too. Wherever gases or liquids flow through pipe in your plant, there is a real opportunity for savings. It will cost you nothing to get the facts. Simply send the coupon.

ROCKWELL

The leading single source for Measurement / Control products and ideas



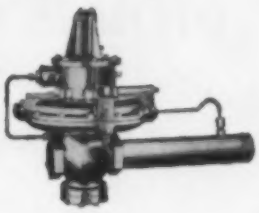
"IN-PLANT" METERING:

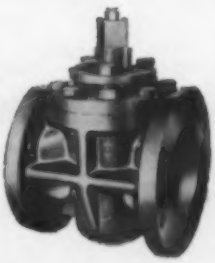
LIQUIDS AND GASES

Rockwell gas and liquid meters, properly applied, can improve quality control, sharpen cost control, and prevent waste in almost every plant department. A Rockwell Field Engineer can help you find *where* meters will cut costs . . . and Rockwell has a complete line of meters to measure practically anything that will flow through pipe.

CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES





More efficient control of all the material flowing through pipes in your plant is a positive step in cutting costs. There are new applications and new ideas for using gas pressure regulators and valves that will stop wasteful, inefficient, and dangerous handling of fuels, production fluids, and products. A Rockwell Field Engineer can show you *where* and *how*.

HOW MUCH COULD YOU SAVE?

There is hardly a plant of any kind—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. It will cost you nothing to have a Rockwell Field Engineer *show* you. Simply send the coupon below, now.

SEND COUPON NOW!

MEASUREMENT & CONTROL DEVICES

another fine product by

ROCKWELL

Rockwell Manufacturing Company, Pittsburgh 8, Pa., Dept. MC28

☐ Please have a Rockwell Field Engineer call me for an appointment.

Please send literature on ☐ Controlling gas pressures; ☐ Valving gases, liquids and slurries; ☐ Measuring liquids; ☐ Measuring gases.

I am concerned primarily with ☐ Light & Heavy Metal Fabricating ☐ Basic Chemical Production ☐ Chemical Processing ☐ Food, Drugs & Tobacco ☐ General Manufacturing Operations ☐ Petroleum Processing

☐ Others: _____

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ Zone: ____ State: _____

Look how Pittsburgh Fiber Glass Insulation Products provide top thermal and acoustical control... help you save installation time

Check these Pittsburgh Fiber Glass Insulation advantages:

Lightweight—adds only negligible additional weight to any job.

Easily handled—readily cut with knife, shears or die; flexibility provides fast installation.

Dimensional stability—does not shrink or stretch, assuring long-lasting insulation control.

Inorganic—not affected by moisture or heat, will not rot, mildew, oxidize or age; flame resistant, odorless.

Economical—requires less bulk for effective insulation as compared with ordinary insulation; easy application cuts time costs.

FOR ALL-AROUND PERFORMANCE, SPECIFY PITTSBURGH FIBER GLASS INSULATION

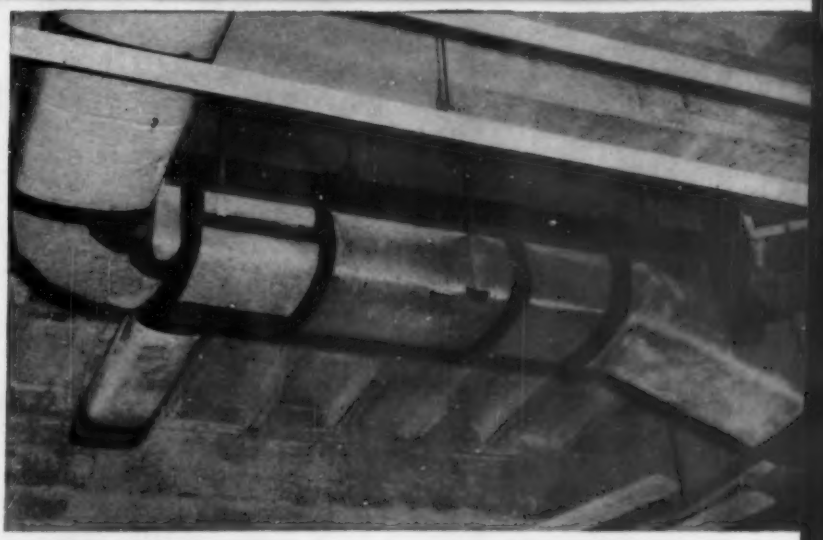
In new construction, modernization or routine maintenance, for piping or duct work, insulation products by PPG will give you the quality acoustical or thermal service you're looking for. For more information, call your nearest PPG Sales Office, or write to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.*

Sales Offices: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Houston, Jacksonville, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco and Washington

Pittsburgh Superfine Duct Insulation

FOR THERMAL CONTROL

wrap-around fiber glass insulation, available in a variety of facings . . . shipped in blanket form . . . lightweight, easily handled . . . clean, non-irritating, odorless . . . good appearance . . . high thermal efficiency . . . flexible, resilient . . . readily fits any desired dimension . . . can be glued, tacked, taped or tied.



Pittsburgh Superfine Duct Liner

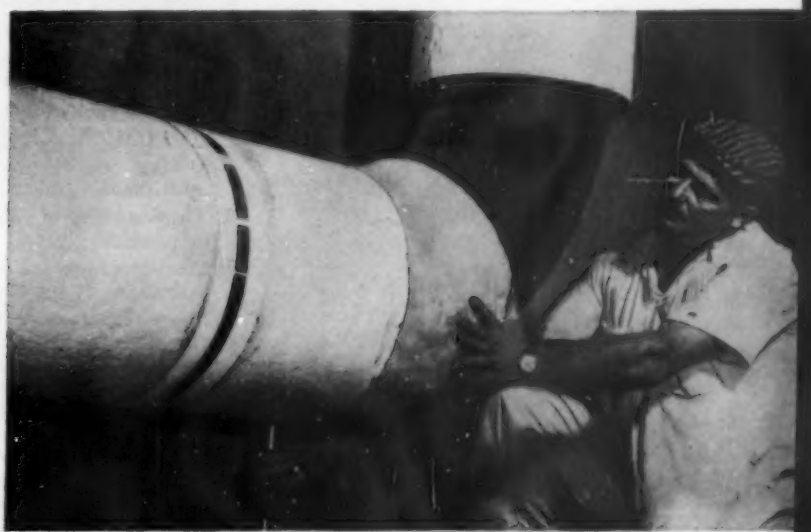
FOR THERMAL AND ACOUSTICAL CONTROL

coated with neoprene to prevent air erosion and reduce air resistance . . . low k factor . . . shipped in easy-to-handle lightweight rolls . . . easily cuts to correct size . . . can be glued, tacked or taped . . . can be applied to flat sheet before forming.

Pittsburgh Pipe Insulation

FOR THERMAL CONTROL

molded into a flexible hollow cylinder, slit along its length to provide quick application to pipes or tubing . . . provided in three-foot lengths, with or without jackets, in nominal wall thicknesses ½", ¾", 1" and 1¾" in all standard IPS and CWT sizes . . . has high thermal efficiency . . . low maintenance.



FIBER PG GLASS PITTSBURGH PLATE GLASS COMPANY

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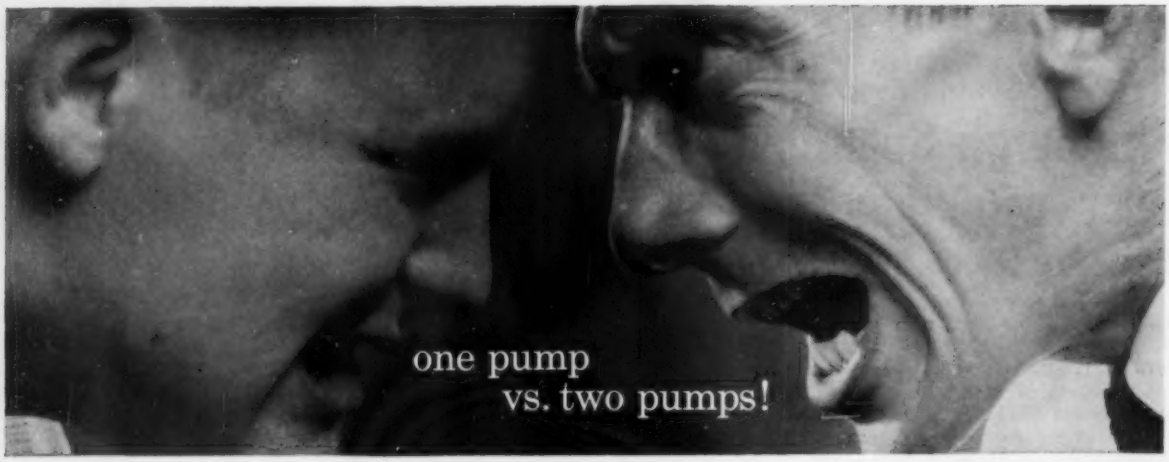


Which pumping system is for you?

Phil Olmstead,
Chief Engineer, Goulds Pumps, Inc.
tells you how to find out

The mammoth pump you see here—Goulds Fig. 3420—can handle up to *40,000 gallons per minute!* Think of it—enough to fill an average-size swimming pool in less than a minute!

Yet with two or more smaller pumps in parallel—such as the Goulds Fig. 3405 centrifugals, also shown here—you could fill that swimming pool just as fast, though your strength would be divided.

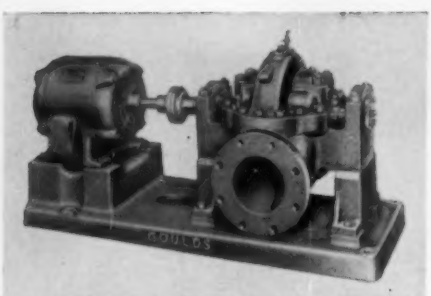
Which is the most effective way to do it?

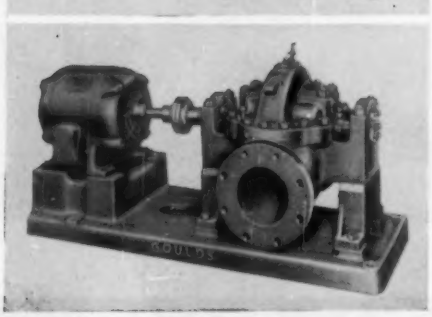
ONE PUMP?

1. With the Fig. 3420, you make just one installation, thereby save installation time.
2. Your installation takes up less space.
3. Your piping is simpler and less expensive.
4. You pay a lower initial cost: one pump, one driver, one coupling.
5. Your operating costs are lower. Big pumps have inherently higher operating efficiencies; you save on power.
6. You service just one pump; maintenance costs are lower.

TWO PUMPS?

1. During critical periods, having a *battery* of Goulds Fig. 3405 centrifugals can save the day: all "eggs" are *not* in one "basket."
2. The flexibility of two pumps lets you accommodate varying needs more efficiently.
3. Smaller pumps are easier to handle, therefore easier to install and maintain.





These points might make you wonder which system *is* right for your needs specifically. To be sure *all* important considerations are covered before you make your final decision, call in a pump specialist. Goulds application engineers help pump users make decisions like this all the time, will be glad to help you determine which system most accurately, economically and efficiently meets your needs.

I can help you get in touch with a Goulds application engineer if you write to me, Phil Olmstead, Goulds Pumps, Inc., c/o Dept. PE-20, Seneca Falls, N. Y. I'll also forward any information you might want on the pumps I've mentioned.

GOULDS GP PUMPS

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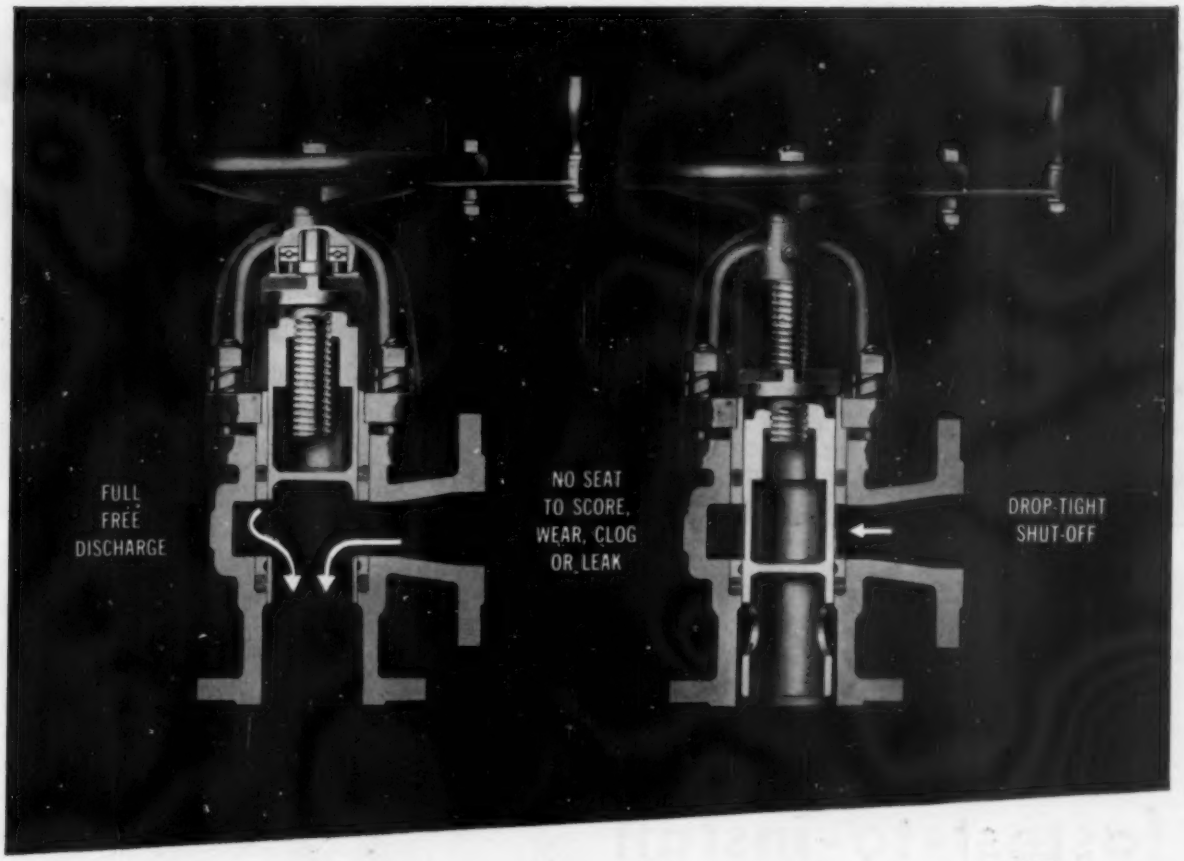

open and shut case!

...FOR TROUBLE-FREE PERFORMANCE WITH YARWAY SEATLESS BLOW-OFF VALVES

Mention Yarway Seatless Blow-Off Valves in more than 16,000 boiler plants, and you'll get solid approval—for these plants have first-hand *experience* with the dependable, trouble-free, service of Yarways.

For boiler blow-down service at all pressures up to 415 psi, YARWAY SEATLESS (in tandem) is the popular choice.

Outstanding feature is the famous seatless design—*there is no seat to score, wear, clog or leak*. Nitralloy hollow sliding plunger permits full, free discharge, yet keeps valve drop-tight in closed position. *No other blow-off valve has these features.*

Specify Yarway Seatless Valves when ordering new boilers and when replacing worn or inefficient blow-off valves on your present boilers.

Yarway Bulletin B-427 gives full information. Write for it today.

YARNALL-WARING COMPANY
100 Mermaid Ave., Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY
A MARK OF QUALITY IN STEAM ENGINEERING

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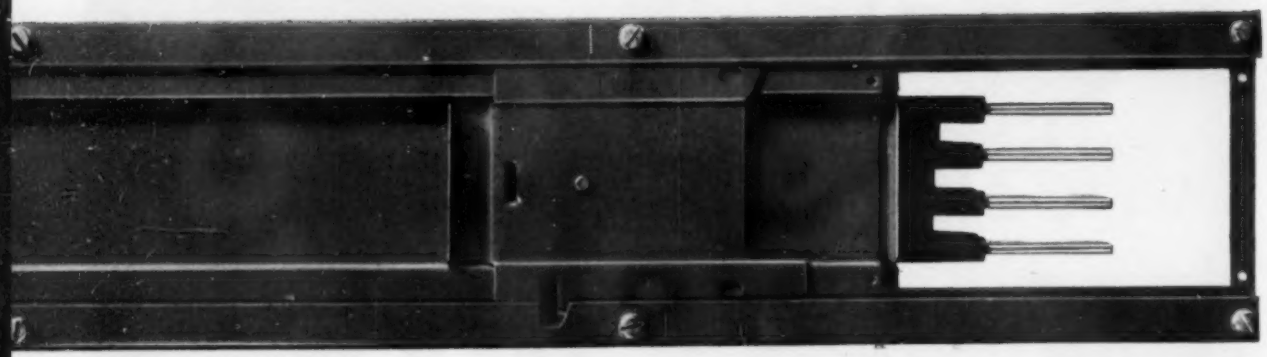
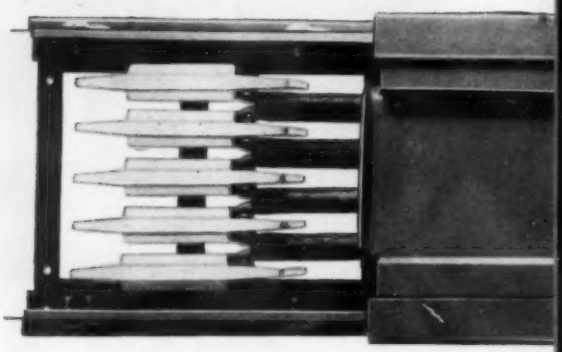
INTRODUCING NEW

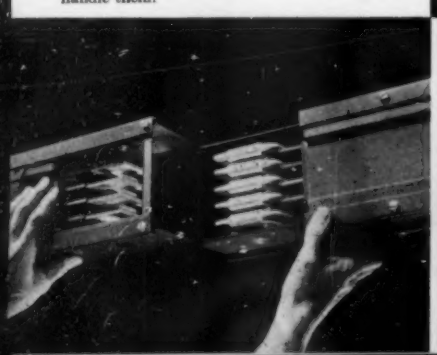




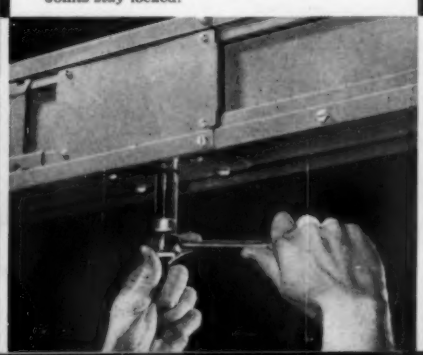
The safest, fastest-to-install plug-in duct ever designed!

Now BullDog, the originators of Bus Duct systems, gives you new safety for plant personnel plus new installation speed and economy with new XL BUStribution duct! Completely Butyl covered aluminum bus bars give true dead-front construction. Crews can now install more duct in a day than ever before. Superior engineering provides low voltage drop . . . down to half that of other plug-in duct systems . . . plus unexcelled short circuit rating. BullDog gives you completely engineered fittings. You can get everything you need from a single source —your local BullDog distributor. Call him—he'll give you a demonstration of all the XL safety and installation features.

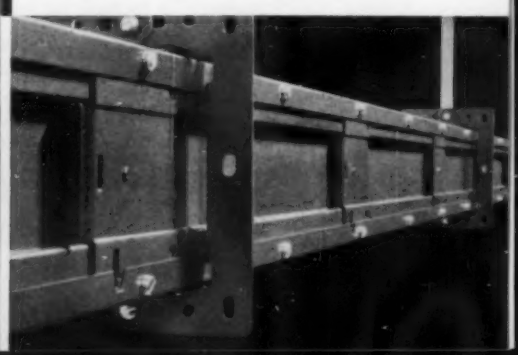
FAST INSTALLATION
Keyed bus ends align themselves positively, instantly, without fumbling or wasted time. You can position sections as fast as you can handle them!



EASY INSTALLATION
This one integral bolt locks POSITIVELY . . . holds keyed bus ends under a ton of pressure. The fully insulated bolt spins tight *fast*. Joints stay locked!



ECONOMICAL INSTALLATION
You need only half as many hangers as usual. Ten-foot supporting spans cut number of hangers *and the time needed to install them* by 50%.



BULLDOG

XL

BUStribution® DUCT

The new **XL SAFETY-PLUG** is faster, safer to use than any other plug!

XL Safety-Plug has new, simplified design. You can plug-in on XL duct in seconds. It has safety features not found on any other plug. Plugs are available which prevent installation or removal when plug handle is in the "on" position. You can plug in from either side of the duct, in all duct sizes from 225 through 1000 amps. You can use all plug-in openings at the same time, if desired.

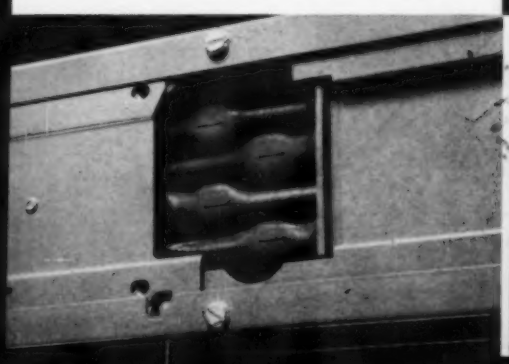
When you see your BullDog distributor about XL duct, examine the Safety-Plug he has on display, too. Here's an electrical team you can depend on to do the job better in every way!

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

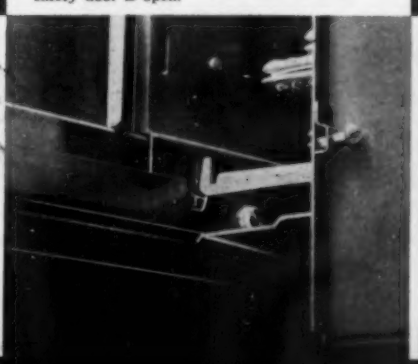
DEAD-FRONT SAFETY

Each bus bar has full-length Butyl insulation, even in bus plug openings. XL BUStribution Duct is the world's safest duct to plug into, to work around.



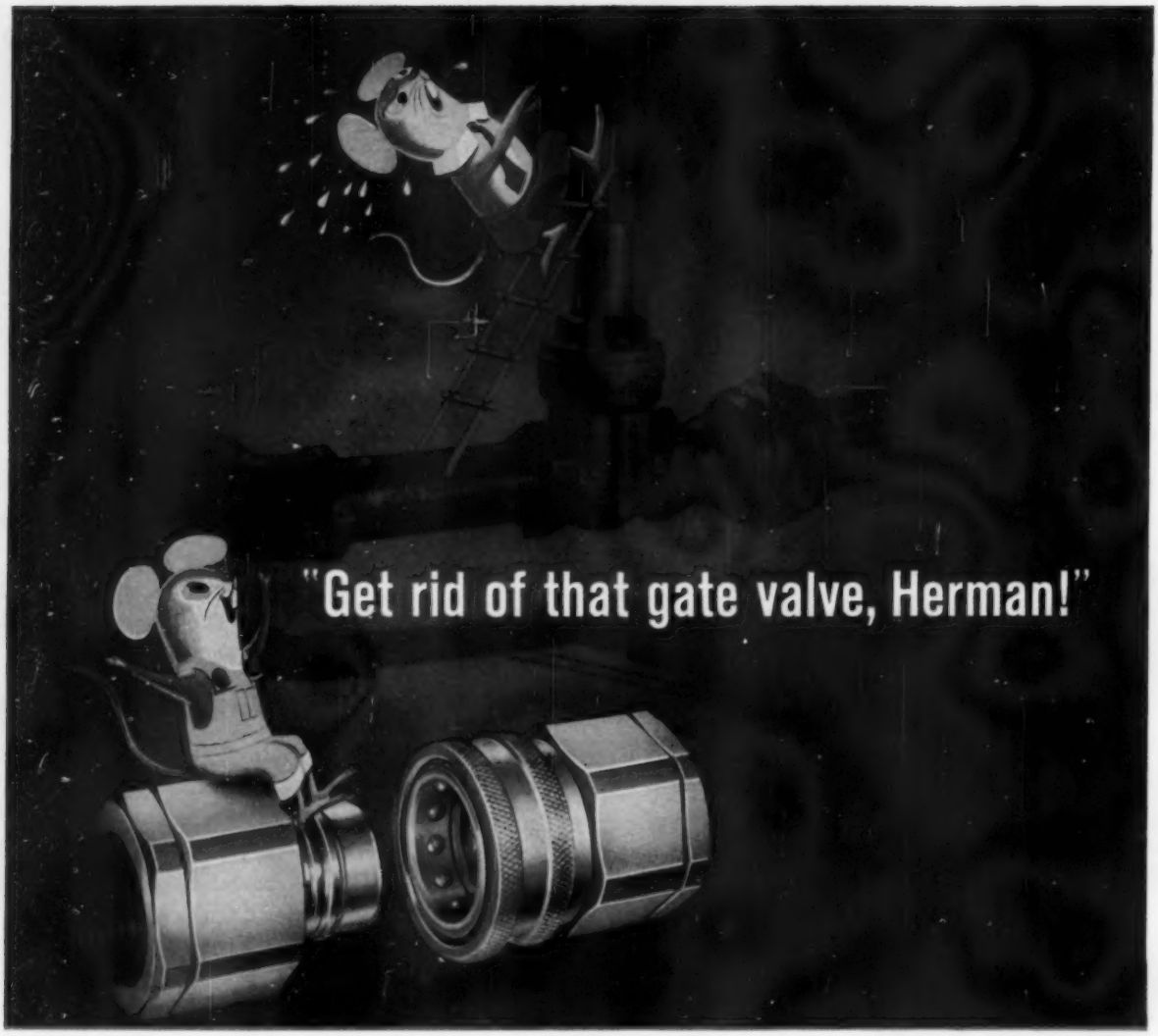
PERSONNEL SAFETY

Safety door covers the opening . . . slides back when safety interlock finger is in position. Plug cannot be removed or installed when safety door is open.



EQUIPMENT SAFETY

SAFETY PLUGS cannot be installed or removed when in the "on" position . . . exclusive design positively protects against arcing, safeguards equipment.



Use Snap-Tite Valved Couplings and you'll always know when you've stopped the flow!

Use Snap-Tite valved couplings and you'll never have to test lines to see if flow has stopped as you do with conventional valves.

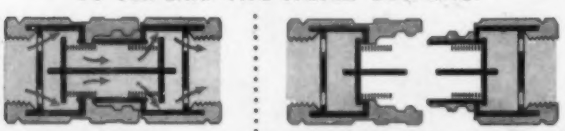
The instant you disconnect the two halves of a Snap-Tite coupling, flow stops . . . and you know at a glance the line is closed. Reconnect and right away full flow begins again.

Snap-Tite couplings take up less space, prevent the possibility of leaking valves, save time and money in installation and maintenance. Ask your local Snap-Tite representative how much you can save by using Snap-Tite couplings.

SIZES: ¼" to 6" in aluminum, brass, steel and 303 and 316 stainless. Larger sizes and other metals on special order.

For more information, write for Snap-Tite Catalog #58. Ask for the name of your local Snap-Tite representative.

TO USE SNAP-TITE VALVED COUPLING:



CONNECT—Full flow instantly

DISCONNECT—Stop flow instantly

★Snap-Tite

ST-59-04

UNION CITY 5, PA.

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WHAT'S JUST AHEAD IN THIS ISSUE?

- CENTRALIZED OIL recirculating systems can be used to obtain reliable lubrication for heavy equipment or to apply oil-base coolants to cold rolling of metals. A review of the requirements of such a system—basic design, pumps, strainers, filters and other accessories—appears in the article "Continuous Flow Oil Circulating Systems" on page 103.

- CLEANLINESS PLUS—in the form of air showers, nylon smocks, central vacuum systems, critical and super-critical areas, triple filtration of solvents—helps make a modern New England plant unusual. These factors are important in the manufacture of superprecision bearings. For the plant engineering insight on the provisions to attain the ultra in cleanliness at the Barden plant, turn to page 106.

- COMPRESSED AIR leaks checked by the clock! In this system, two clocks monitor pumping time. If it exceeds a preset standard, leak investigators check the air lines. To learn how this system of gaging leaks came about and also what corrective measures were taken to reduce leakage, refer to the article starting on page 110.

- PRACTICALLY everyone recognizes the value of plastisols in corrosion prevention service. The cost of applying these coatings under various conditions is not so well understood. In the article starting on page 112, the author presents cost comparisons between do-it-yourself jobs and jobs done by outside contractors.

- A THOROUGHGOING study of lighting practices in industrial plants was recently completed by PLANT ENGINEERING's Research Department. To find out how your plant stands in relation to others in the country, read the article "Industrial Lighting Practice," starting on page 121. Among other areas, it explores group relamping programs, reflector washing, electrical energy consumed by lighting system, and the use of standards.

- ENERGIZING MEDIUMS, notification methods and sensing elements—these are some of the facets that play a part in the big picture of emergency shutoff and alarm systems. The article "Alarm Instrumentation," beginning on page 132, discusses the design and application of such warning devices and systems.

- UNDERSTANDING electronic rectifiers—what they are and how they work—can help you and your men reduce downtime. Characteristics of the three types—high vacuum tube, mercury vapor tube and semiconductor—as well as half-wave and full-wave circuitry are described in the article starting on the next page.

UNDERSTANDING ELECTRONIC RECTIFIERS

What They Are—How They Work

By R. D. GAMBRILL, Department Chief, Test Set Development, Western Electric Co., Inc., Baltimore, Md.

ALTERNATING VOLTAGES have become standard throughout industry due to the relative ease of transforming the voltage to higher levels for economic transmission over long distances. In addition, there are advantages in reduced maintenance using a-c induction motors in place of conventional d-c motors.

However, there are many processes such as electroplating, welding, battery charging and power supplies for electronic control which require direct current. To obtain d-c current from a-c sources, it is necessary to use a rectifier and this is probably the most widely used electronic device in industry.

Rectification is usually accomplished using either electronic tubes or some form of semiconductor. Of these, the vacuum tube is perhaps the most familiar. Its action in an electric current is similar to the action of a check valve in a hydraulic pipe line. It is interesting to note that these tubes are called valves in England.

In its simplest form the tube consists of an electrically heated filament, an anode and an enclosing glass envelope from which as much air as possible has been removed. When these elements are properly insulated, the filament is heated to a high enough temperature and a positive voltage is applied to the anode with respect to the filament, electrons will flow from the filament to the anode, Fig. 1.

This phenomenon is known as thermionic emission and is caused by the heat in the filament making the molecules in the metallic filament move fast enough to permit the release of electrons. The positively charged anode is close enough to attract these electrons resulting in a current flow.

Applications of this phenomenon are many and varied but it is important to pay particular attention to the conditions involved. First, the filament temperature must be set for good emission consistent with reasonable filament life. It is important that filament voltages be kept fairly constant. Second, the electron flow or plate current will vary with the potential difference and will flow only when the plate is positive.

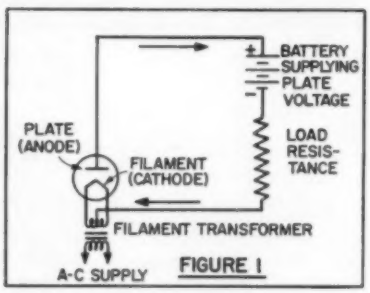


Fig. 1. When a positive voltage is applied to the anode, electrons will flow from the hot filament to the plate.

The significance of this characteristic is obvious. The amount of plate current will not only be governed by the plate voltage but no current at all will flow when the plate is made negative with respect to the filament. When alternating voltage is applied to the tube, Fig. 2, plate current will flow only during the positive half of the cycle and rectification will occur.

Using the hydraulic analogy and considering voltage to be synonomous with pressure and current to be the same as liquid flow, it can be seen that if the tube acts as a check valve more current will flow through the tube when the voltage is increased just as more liquid will flow through the valve as the pressure is increased. Still applying the same comparisons no current will flow in the reverse direction just as no liquid can flow in the reverse direction through a check valve.

There are two general classifications of industrial rectifier tubes and these are high vacuum or "hard" tubes and mercury vapor or "soft" tubes. The high vacuum tubes have a definite resistance to current flow known as the plate resistance. The mercury tubes have a fixed voltage drop across the tube regardless of current flow.

Semiconductor rectifiers contain elements which have a relatively low resistance to the flow of electric current in one direction and a high resistance in the opposite direction. This phenomenon is caused by the fact that semiconducting materials, when properly combined with other elements, have either a surplus of electrons or a missing electron.

When a voltage of proper polarity is impressed across these materials, an electron current will flow in such a way as to attempt to equalize the electron distribution within the material, Fig. 3. It should be noted that even when connected for forward conduction the electrical resistance of these materials is much higher than that of usual conductors such as copper or nickel.

Three Types of Rectifiers

As a result of these characteristics, these units will perform somewhat the same as electron tubes but with certain differences. They have a forward resistance which restricts current flow in a manner similar to plate resistance in a high vacuum tube but they conduct to some degree in the reverse direction whereas a vacuum tube does not. Semiconductors have no filament and consequently there is no warmup time required.

Referring to Fig. 4a, the high vacuum tube will provide a wide range of output voltage with a limited range of load current. Due to the voltage drop across the plate resistance of the tube, the output regulation will be relatively high.

Mercury vapor tubes, Fig. 4b, will provide good regulation over a wide current range but at somewhat limited voltage outputs. There is always a voltage drop across these tubes in the order of 9 to 15 volts. This voltage is "lost" across the tube and the supply voltage must be adjusted to compensate for this loss. This is relatively unimportant at higher voltages but can be a major consideration at very low voltages such as those used in electroplating processes. The maximum voltage that may be impressed across these tubes can be 10,000 volts or more. This is much higher than the voltage that can be impressed across a semiconductor but still less than the maximum voltage rating of high vacuum tubes.

Semiconductor rectifiers, Fig. 4c, will supply high currents with limited voltages across the rectifier units and with limited regulation due to the voltage drop across the forward resistance. These comparisons are made on the basis of generalities only and are not intended to apply to special units.

Since the parameters of all commercial electronic devices are listed by the manufacturers, the values of peak output voltage and current may be readily calculated.

The example in Fig. 5, applies to

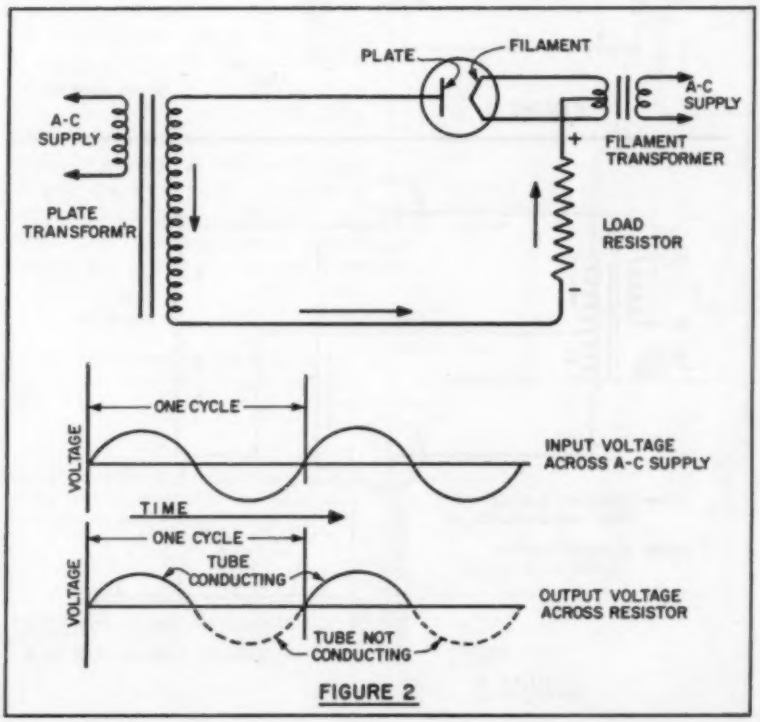


FIGURE 2

Fig. 2. When alternating voltage is applied to tube, plate current will flow only during the positive half of cycle.

Fig. 3. Electron current flow in semiconductor is attempt to equalize electron distribution within the material.

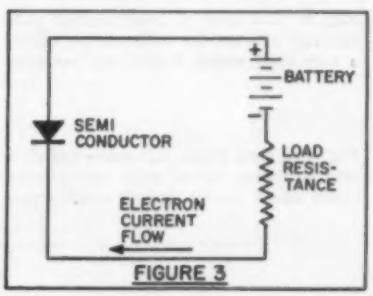


FIGURE 3

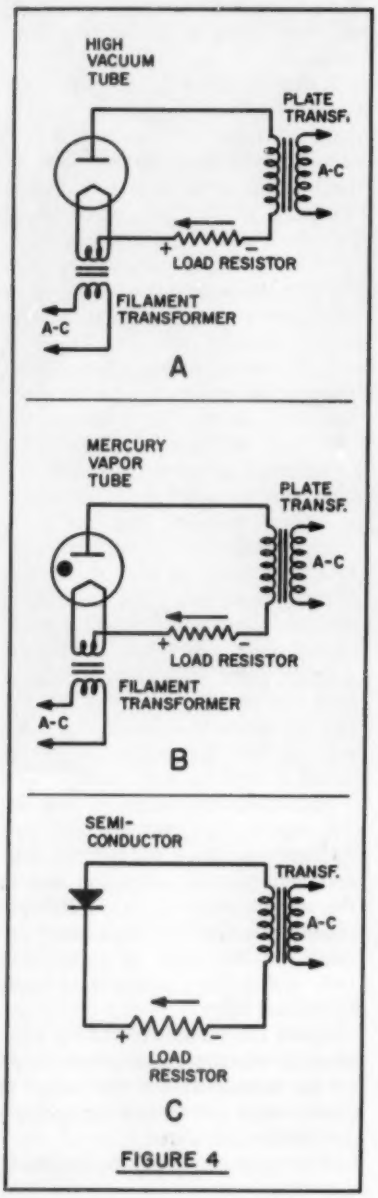


FIGURE 4

Fig. 4. Three popular rectifier types have different characteristics but all three produce a unidirectional output.

Fig. 5. Example of peak output voltage and current for a circuit supplying a test load which is entirely resistive.

Fig. 6. Single-phase full-wave rectification is accomplished with two rectifier tubes and a center-tapped transformer.

a load which is entirely resistive. If the load were a capacitor instead of a resistor the voltage would rise to the peak value and remain there and no current would flow after the initial inrush. The peak and average voltage would then theoretically both be 100 times the square root of two (1.414) or 141.4 volts. Of course, from a practical standpoint, all capacitors have some leakage but precise calculations have not been attempted here.

Combinations of resistive, capacitive and inductive components would change the output voltage and current both in value and in wave shape.

All the information supplied to this point has applied entirely to half-wave rectifiers. Since these conduct current only half of the time, full-wave rectifiers are used almost entirely in commercial practice except for very light loads.

Single-phase, full-wave rectification can be accomplished with two rectifier tubes and a center-tapped transformer, Fig. 6. In this circuit, tube No. 1 conducts during the first half cycle as shown by the solid arrows and tube No. 2 conducts during the second half cycle as shown by the dotted arrows. As this system employs a center-tap on the transformer, the output voltage will be somewhat less than one half of the transformer secondary voltage.

To overcome this deficiency, a full-wave bridge circuit, Fig. 7, can be used to obtain output voltages nearly as high as the transformer secondary voltage. In this circuit, tubes No. 1 and No. 3 conduct in series for one half cycle and then tubes No. 2 and No. 4 conduct for the other half cycle. In both cases the entire transformer winding is used to deliver voltage to the system.

When large amounts of power are

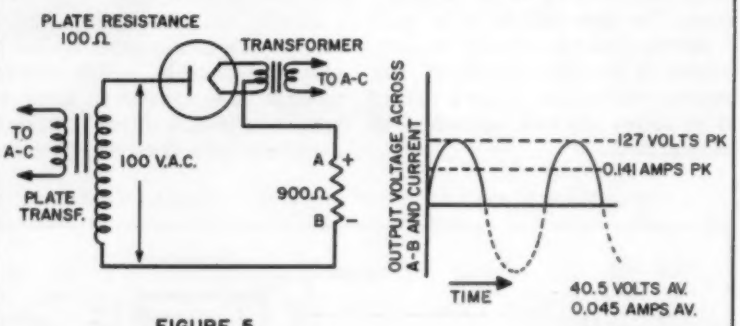


FIGURE 5

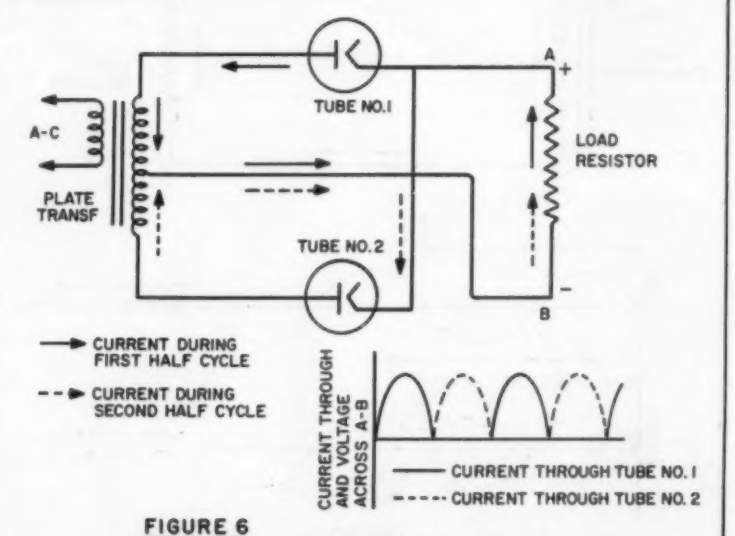


FIGURE 6

to be transmitted, polyphase rectifiers are the most efficient type. The operation of these three-phase rectifiers are more difficult to depict diagrammatically due to the great number of lines which would have to be drawn. If we assume one end of the transformer winding to be negative and the other to be positive at a particular instant, it is relatively easy to follow the path of electron flow.

A half-wave rectifier for a three-phase source is shown in Fig. 8. As in the full-wave rectifier, each tube conducts on a half cycle and sends a pulse of unidirectional rectified current through the load. The dotted curves show how each rectifier conducts during one cycle of the applied 60 cycle source and the solid line shows the output.

A circuit for a three-phase full-wave bridge rectifier is shown in Fig. 9. It is similar in many respects to the single-phase full-wave bridge rectifier and the similarity goes further if it is noted that two tubes conduct in series at any instant.

The a-c component in the output of a d-c source is called ripple. Note that the ripple voltage in the three-phase half-wave rectifier is much less than in the single-phase full-wave rectifier. Note also that the frequency of the ripple voltage in the three-phase half-wave rectifier is 180 cycles per second; that in the single-phase full-wave rectifier it is 120 cycles per second and in the single-phase half-wave rectifier it is 60 cycles per second. The three-phase full-wave rectifier has a ripple frequency of 360 cycles per second. As it is easier to filter a high frequency signal, full-wave rectifiers are generally used where smooth d-c output is required. **End**

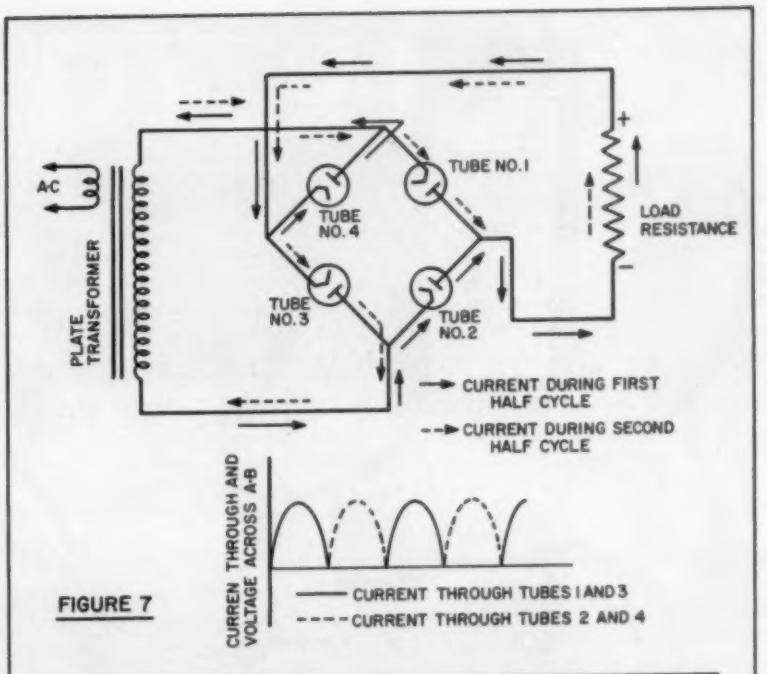


FIGURE 7

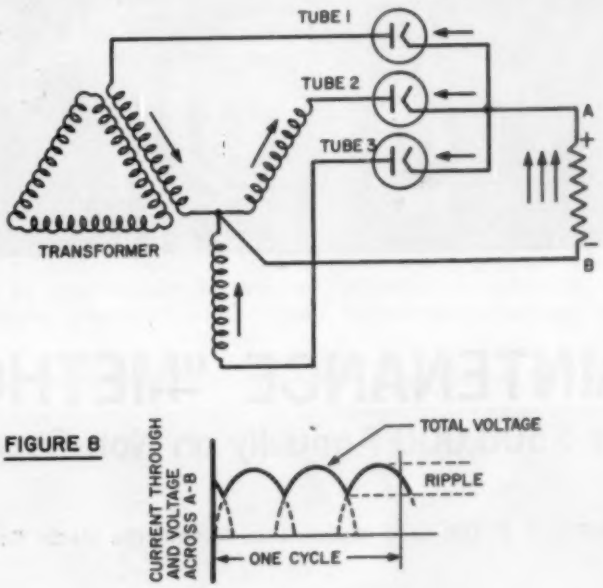


FIGURE 8

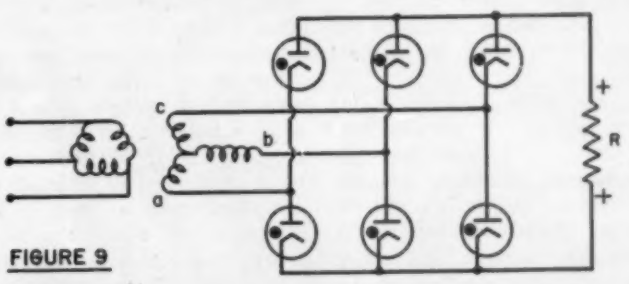


FIGURE 9

Fig. 7. Full-wave bridge rectifier circuit is used to obtain output voltages near transformer secondary voltage.

Fig. 8. Half-wave rectifier for a three-phase source conducts on each half cycle produces unidirectional current.

Fig. 9. Three-phase full-wave bridge rectifier for heavy loads. Two tubes conduct in series at any given instant.

Fig. 1. Supervisor accepts plaque for his work center which submitted best method.

MAINTENANCE "METHOD FEVER"

Saves $500,000 Annually on Non-Repetitive Jobs

By KENNETH M. ECKER, Supt. Maintenance Section, The Martin Co. Baltimore, Md.

HOW DO YOU START a methods improvement program in a department where much of the work is non-repetitive, as in plant maintenance?

This was the big question posed when we set up our methods program, designed to stimulate employee interest, eliminate unnecessary operations and use of materials, create an attitude of constructive thinking and, finally, to save money.

This problem was effectively resolved with a plan to have designated supervisors spend one hour a week in another supervisor's work area looking over the manner in which the work was being done. After asking some basic questions such as how, why, what and when, it immediately became obvious that the area being studied was wide open for many new profitable methods. Mechanics as well as supervisors readily caught the "method fever" and before we expected it, new methods began rolling in.

These new methods are discussed in the various supervisory meetings, thereby broadcasting them and supplying food for thought for others.

In the room where these meetings are held there is a chart listing all work centers. Each work center has the supervisor's name and his portion of the annual goal prominently displayed in bar chart form. As he progresses the chart is adjusted to show his gains. This places all sections in keen, visible competition with each other.

Our program has been in effective

operation for several years with an annual goal of $500,000, which has been met or nearly met each year.

Literally thousands of suggestions have been submitted during the past few years. All of them have not been put to use but the large majority has been used with great effectiveness and many have brought about significant savings in time and money.

Savings from Suggestions

A good example of the type of suggestion the system brings in, was the suggestion that the painted white stripes on the parking lots be replaced with metal discs painted white. The discs were cast iron, designed to offer no obstruction to the automobiles, but impervious to wear from cars or weather. It was estimated that the cost of painting lines on the parking lots was $3300 per year or $16,500 for a five-year period. The metal discs cost 85 cents a piece or $10,200 to equip all the parking lots. The total cost for the markers, the installation and the maintenance for a five-year period was $12,000. This achieved a saving of $4500.

In another instance one of the men who service the air conditioners suggested that the two-inch-thick filters be replaced with two, one-inch-thick filters. The filters require changing every two weeks simply because the front surface of the filter becomes clogged with dust and dirt. With two one-inch filters, the front one can be replaced with a clean filter thereby replacing one half of the filter each time. The two-inch filters cost 89 cents while the one-inch filters cost only 57 cents each. This is a reduction of better than one third and when it is taken into consideration that the Martin-Baltimore division was using 387 two-inch filters every two weeks this becomes a real saving.

A new method for washing and relamping of lights in the machine shop is indicative of the improvements a worker will make in his job if he is encouraged to do so.

The operation of washing and relamping the lights in the Machine Shop required three men: one on the ladder, one to hold the ladder and one to pass the equipment to the man on the ladder. There was not only an element of hazard in this operation but it was also very slow. In addition, when the workers came to a light directly over a machine the operator would have to stop work until the job was finished. At the suggestion of a worker a scaffold was designed that mounted on the rails of the overhead crane. The scaffold spanned the width of the bay thereby allowing three men to work on the three lights across the bay simultaneously. This reduced the time spent on each light by approximately 20 min and eliminated production interruptions.

The savings in the machine shop alone have been reckoned at better than $1800 a year and the method is now being put to use in the rest of the plant.

We know that after years of careful screening for better methods, the pickings begin to get thin. New stimulants become necessary, for example last year we instituted a method of the month. Each month all methods were reviewed by the general foreman, the supervisor of the standard and methods section servicing the maintenance department, and the maintenance superintendent. Here all new material was graded and evaluated and the best one was selected.

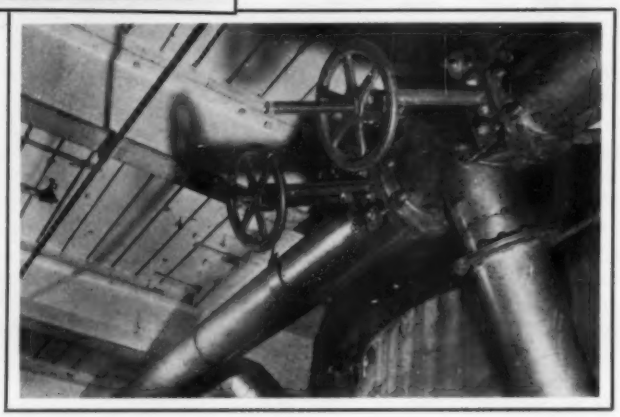
"Method of the Month" Award

An in-use photograph of the best method was made and posted with those of previous months. A specially engraved plaque, bearing the supervisor's name, is awarded each month to the work center from which the best method has been chosen.

Many of the people participating in the methods improvement program submit their ideas to the company's suggestion department. After careful review and evaluation the suggestor is frequently rewarded with a cash payment which further stimulates his efforts in the method improvements program. **End**

Fig. 2. Men work on scaffold on overhead crane. Time required for washing, relamping a light has been reduced by 20 min.

Left to right: Five-foot lengths of pipe are formed from stainless steel. Clamped tight, the seams of a 16-gage steel pipe are welded. Easy handling simplifies installations. Below: View of ceiling installation shows welded pipe joints, flanged pipe joints and lightweight hangers.



SHOP-MADE PIPE SOLVES PROBLEMS REDUCES COSTS

By E. WAY CLARKE, Vice-President Production, Knowlton Brothers Paper Company, Watertown, N. Y.

PIPING REQUIREMENTS of a paper manufacturer present a difficult problem at best, but in a specialty plant, where runs are short and frequent product changeovers are the normal state of affairs, plant piping assumes major importance.

Knowlton Brothers manufactures a wide variety of specialty paper products that includes liquid and air filter papers, impregnating base papers for insulators and printed circuit boards, photographically inert papers, and special technical paper products that incorporate such materials as cork, nylon, carbon and glass, as well as the more common cellulose in its many forms.

Because of this product diversity it is essential to be able to change from one product to another with minimum clean-up time.

In paper making, large batches of pulp mixtures must be rapidly transferred from one area to another. Large diameter pipes (8 and 10 in.) are used to handle the gravity or, low pressure pump-induced flow.

Stainless steel was a logical choice at Knowlton Brothers, because of its ease of cleaning and its resistance to the acids, alkalis and other ingredients used in specialty papers. However, the high cost of standard stainless steel pipe, its heavy weight due to wall thickness for high pressures, the necessity of using standard elbows and other fittings (which limited flexibility) led our engineers to consider fabricating thin wall stainless steel pipe.

Our studies resulted in the decision to install the necessary equipment to fabricate our own pipe and fittings from sheets of 16 gage type 304 stainless steel. The acquisition of the necessary shop equipment—roll, saws, forming devices, and welders—not only made it possible to make our own pipe, but also provided the equipment for fabricating many other items needed.

Most of the pipe made for use in our plant is either 8 or 10 in. in diameter; standard length of individual sections is 5 ft. It is formed on the roll from appropriately sized sheets, and the seam is welded. When installed, pipe sections, tees, and other fittings are welded in place.

Advantages of the shop-made pipe are many. First of all, it costs approximately 40 to 45 per cent less than purchased stainless steel pipe of similar size.

The light weight of the thin-wall pipe makes installation a simple process, and greatly reduces labor costs, since fancy rigging is not necessary to hoist pipe into position. In addition, much lighter hangers and supports can be used.

Knowlton Brothers' engineers plan in detail each replacement and installation job in advance, and then release prints to the pipe-sheet metal shop for fabrication of components.

Equipment used in the sheet metal shop, purchased expressly for the program, is as follows:

Bending roll, a No. 60 unit made by Wysong and Miles Co., Greensboro, N.C.

Band saw, No. 8 Marvel, made by Armstrong-Blum Mfg. Co., Chicago, Ill.

175 amp arc welder made by Lincoln Electric Co., Cleveland.

Nibbler, used for special cutting work, made by Fenway Machine Co., Philadelphia, Pa.

Cutting torch made by Arcair Co., Lancaster, Ohio. (This is used for cutting tricky forms for pipe and other stainless work.) **End**

HOW TO CUT PLANT OPERATING COSTS

CONSERVATION OF:

1. WATER
2. STEAM AND AIR
3. MACHINE PRODUCTIVITY

CONSERVATION OF steam, water, compressed air and machine productivity were the subjects of a panel discussion at a recent joint meeting of the Valley Forge, Wilmington and Philadelphia Chapters of the AIPE. Delivering talks were Gerald S. Bataille, Bataille, Kane & McKie, Chicago; Salvatore S. Guzzardi, Consulting Engineer, Philadelphia, and Luther Eschner, Plant Engineer, International Resistance Co., Philadelphia. Tom Hanson, Editor, PLANT ENGINEERING, acted as moderator.

Sixty three members of the AIPE were in attendance including National AIPE President Wm. Wallin, Western Electric Co.; R. E. Robbins, du Pont, President, Wilmington Chapter; Vello Tou, Daystrom, Inc., President, Valley Forge Chapter; and one of the speakers of the evening, Luther Eschner, President, Philadelphia Chapter. Pertinent portions of the three talks are presented here.

CONSERVATION OF WATER

By Gerald S. Bataille, Bataille, Kane & McKie, Inc.

OVER THE PAST ten years, there has been a constant growth of interest in conservation of industrial water. Sharp increases in water rates, water shortages in certain areas, and the need for effective cost reduction programs have all contributed their share in bringing to light the opportunities for materially reducing the water consumption of industry.

There still remains, however, considerable doubt in the minds of many plant officials as to the reality of the savings that can be made in water conservation.

Recently we called on the engineering staff of a large meat processing plant. We were told "We are so tight in the use of water that we have even taken the squeal out of the faucets."

With considerable persuasion this firm agreed to such a study, which brought about a reduction in annual water consumption of more than 80,000,000 gal. That is considerably more than a squeal.

In 85 per cent of the instances where plant personnel believed there was little or no opportunity to reduce water consumption, preliminary studies revealed that potential savings varied from good to excellent. In several of these plants, it was decided to have surveys made, and water consumption was reduced from 20 to 60 per cent. With an enthusiastic attitude toward the possibilities of reducing water consumption, excellent results were attained.

A good example of this was the A. O. Smith Corporation job at Kankakee, Illinois, where attitude was excellent, and, as a result, water consumption was cut 65 per cent.[1]

Recognition of potential savings is the second requisite in a successful water recovery program. Even a simple thing like water bubblers that run constantly all summer long, and often all year round, can be slowed down to 35 or 40 gph., and the water will be just as cold. Put a flow control-valve in the pipe line far enough ahead so no one can change the flow rate. Often bubblers run at the rate of 3 gpm. During the summer months, 40 to 50 bubblers can waste several million gallons of water. All relatively clean water, hot or cold, currently running to drain should be evaluated for possible recovery.

After all the water to drain has been analyzed,

[1]Plant Engineering, June, 1959, page 98.

metered (or measured with a stop watch and a bucket) you have an existing "loss record" established. It is most important that you record the flow rates and dollar value of any existing water loss before you consider saving it. Now you are ready to study various conservation methods. You must decide whether to reduce the flow rate, directly re-use the effluent, or to recondition the water and re-use it. These and many other factors are to be studied and decided upon.

Mechanical means for materially reducing water consumption fall into two general classifications: First, conservation which is usually accomplished by slowing down excessive flow rates with thermostatic valves, orifices or other type controls that restrict and regulate the volume of water being used. Second, recovery, in which water is recovered and re-used, either as is or after it has been reconditioned by cooling, re-heating, filtering. In some instances water may be re-used directly, without requiring a tank or receiver to accumulate the effluent. For example, running the water from the intercooler or aftercooler on an air compressor, to the cooling chambers on the cylinders.

Evaluation data of effluent coolant water must show the amount of temperature rise above tap water temperatures. If, for example, there is only a 2 deg rise in effluent water and it could safely have a 20 deg rise, this water should be mechanically controlled to give you this 20 deg rise. Water consumption will be cut 90 per cent at this point. Whether you try to conserve water by restricting flow, or recover water and re-use it, depends upon the practicability and the economics of the two methods. In many instances, policies on the required rate of return on the investment will have some bearing on the method to be employed.

Usually the conservation of water by restricting the flow with suitable means of control is relatively inexpensive, whereas means of recovering water, cooling it and re-using it are usually relatively costly.

Instead of dumping hot water to drain, there may be opportunities for the use of heated water within the plant. Effluent water heated through a 30 deg rise can be put to good use even if it must be heated to a higher temperature to meet the purpose it may serve. Usually the heat in effluent water is of more value than the water itself.

Where huge quantities of coolant water are heated to temperatures approaching 100 deg or more, and cannot be re-utilized anywhere in the plant, you are faced with the problem of cooling it for re-use. If such hot effluent water is collected throughout large areas of the plant, the use of two or three towers may prove to be more economical than one tower with long supply and return lines. Such a problem as this requires considerable study before arriving at the best solution.

The third requisite calls for sustained dedicated effort. Such effort is essential in order to have continuity of thought to arrive at the most practical and profitable solutions in the over-all reduction of water consumption, and to take advantage of the element of time.

The issue facing industry today, in its effort to reduce costs, is not only a battle of skill against skill, but also a race against time. All production and all loss is measured against the element of time. **End**

CONSERVATION OF STEAM AND COMPRESSED AIR

By Salvatore S. Guzzardi, Philadelphia

IN INDUSTRIAL plants, it is generally assumed that steam for heating is a small item compared to the amount of processed steam. For example, in one large steel fabricating plant with an annual fuel cost of $400,000 it was thought that $300,000 of the fuel was chargeable to process steam. This particular plant had a modern efficient boiler plant built 10 years previously at a cost of over $1,000,000.

There were two 160,000 lb per hour steam boilers operating at approximately 100 psi and equipped for pulverized coal and oil firing. Pulverized coal was being used. A 22 man staff operated this boiler plant.

Our survey analyzed the amount of process steam required at each point of use. During the summer, process steam was used at five locations. In two locations, it was possible to discontinue the operation and eliminate the use of steam. In another location, steam had been used for heating pickling tanks. The substitution of chemicals permitted cold pickling. In the other two locations, the amount of steam required was found to be quite small.

This permitted the shutdown of the entire steam plant during the summer. Interestingly, the actual process steam consumption was so small that the existing large boilers in the boiler plant were not able to operate at such low load.

Two separate compact steam generating units, costing approximately $4000, were installed. During the summer, when the boiler plant was completely closed off, a saving of $80,000 was effected by this capital expenditure of $4000. In addition to a substantial saving in fuel, we were able to shift the 22 man staff to more productive work.

Our analysis determined that out of the $400,000 fuel cost, approximately $300,000 was chargeable to the heating of the plant. This particular plant which had previously considered the cost of steam for heating just a small item did not have any automatic thermostatic controls for reducing or shutting down heating steam during non business hours such as evenings, week ends and holidays. During spring and fall and some part of the winter when the noon day temperature was 60 F or above, heating steam was supplied regardless

—with the result that most windows and doors were left open.

Interestingly, there was an eight man staff whose responsibility it was to manually turn off heating steam when not required in certain areas. Analysis of the steam charts indicated that there was practically no reduction in the steam load during non business hours, which indicated that the efforts of these men were not effective. This staff was costing $40,000 a year.

We recommended the installation of outdoor controls and motorized valves for each building, including zoning within the building that would permit modulation of the steam in accordance with outside temperature. This substantially reduced the heating cost and also eliminated the $40,000 a year temperature regulating staff.

I know of one Philadelphia manufacturing plant which boasts of an 89 per cent boiler efficiency. However, the cost of maintaining this high boiler efficiency involves a large staff of operating engineers to adjust equipment, read graphs, calculate and record data. It would be worthwhile for this plant to accept a 10 per cent reduction in boiler efficiency and save the labor cost of the five additional men required to maintain this exceptional but uneconomical higher boiler efficiency.

Fuel cost can be reduced by the installation of automatic labor-free equipment and controls, automatic indoor-outdoor thermostats, time clocks to turn on and shut off steam in accordance with the requirements, insulation of steam lines to reduce heat losses, and reduction of blow down by the use of water softeners and proper water treatment.

Probably the biggest cost reduction potential lies in the field of labor. We all know labor costs are increasing. We also know it is very difficult to get proper boiler plant labor capable and willing to perform manual coal shoveling, manual adjustment of fuel input and air adjustment, draft regulation, manually maintain proper boiler water level. Therefore, there is an increasing emphasis in reducing boiler plant labor by installation of modern, dependable, automatic devices.

Labor can, in most industrial boiler plants, be eliminated. In some states there are regulations that require a man in the boiler room if the steam pressure is above 15 psi or if boilers are above a certain size.

Our experience has indicated that there is a general assumption that such regulations exist in all states and there is a general misconception as to the context, intent and meaning of the law.

For instance, Pennsylvania and New York state have no state requirement with regard to labor in the boiler room. In one city, we found a local regulation that stated wherever a boiler was operated above 15 psi a licensed operator was required. This was generally assumed by many industrial plants, that a licensed operator must be permanently situated in the boiler room.

An interpretation from the city's legal department explained that the intent was simply to have an operator and that his presence was not required in the boiler room or even in the plant, but simply to have such a man on the payroll and he could be for long periods of time many miles distant from the plant.

Compressed air is an expensive utility, so the compressed air system must be constantly reviewed to be sure that no waste occurs and that the air is effectively utilized.

"Take it easy, Hopkins. Save some mistakes for tomorrow!"

A large shipyard complained of inadequate supply of compressed air and was thinking of putting in an additional air compressor. By visiting the plant on a Sunday evening when there was no production, we were able to find numerous air leaks throughout the distribution system. We found that one large air compressor was operating constantly to supply leakage.

Naturally, by eliminating these leaks we provided adequate air capacity for the plant without the large capital expenditure of a new air compressor. Incidentally, a good test for determining the tightness of the compressed air system is to visit the plant during nonproductive hours and to measure the electrical consumption necessary to supply the air leakage.

In this shipyard, there was a substantial number of pneumatic grinding tools. We discovered that although there was 100 psi at the air manifold, there was a connecting rubber hose, about 40 ft long between the manifold and the tool. The small diameter of the hose caused a substantial pressure drop so that only 80 psi was available at the tool. This caused the normal output to drop 25 to 50 per cent and resulted in less effective use of the tool. In some cases, it required two men to operate the tool. The solution was the replacement of the ⅜-in. hose by a ½-in. hose.

Compressed air was used on a 1500 lb and a 500 lb forge press to shape anchors and shafts. Inadequate air capacity permitted only 5 quick strokes, after which there was insufficient air pressure for further strokes. During the waiting period, it was necessary to put the shaft back into the furnace for reheating. We suggested the installation of air boosters and were able to get more strokes per hammer. **End**

(Please turn page)

MAINTAINING MACHINE PRODUCTIVITY

By Luther Eschner, Plant Engineer, International Resistance Co.

MACHINES HAVE taken on an ever-increasing importance as industrial processes have developed through the years. Many of us can remember the simple worker-machine relationship when each machinist or process worker took care of his own piece of production equipment. It was in this climate that the maintenance function—as a separate function—was born. It was totally dependent on the ingenuity of a few mechanics.

As modern processes and machines developed there evolved a highly complex relationship between the production worker and his machine. Operation, in some of its aspects, became simpler and less tedious but greater technical understanding, on the part of the operator, became necessary. Unfortunately, the management of the maintenance function did not keep pace. We are still trying to solve the basic problems and needs of training skilled personnel.

When machines are added to a process it is usually done to decrease costs and increase production. To achieve this aim, specifications were undoubtedly prepared by the engineer responsible. If the list were to be prepared in a descending order of importance I believe it would look something like this:

1. Quantity Output—The number of pounds, gallons or pieces per hour to be produced. Decisions to invest, or to not invest, money in capital equipment must be based on these figures.
2. Quality Output—This factor has a lot to do with determining the design and complexity of the equipment and the amount of money that will be invested in it.
3. Operating Conditions—Environment in which the machine will operate: outdoors, indoors, dusty or clean atmosphere, heat or cold.

Such a list might contain 50 or more such characteristics but I will confine my remarks to these three.

When these machines are set up in our plants they enter the realm of statistics: cost, weight, size, utility requirements, etc. All this data is very useful but what has happened to the machine so far as the designer's intent is concerned—the reasons why the machine was built the way it was built?

Sometimes, plant engineers forget the reasons why a machine has been built in such a manner and to such-and-such a tolerance. Sliding fits, for example, are made to micro tolerances not to make the machine more expensive but to insure quality and output as specified. How can a maintenance program be set up if these factors are not known? I cannot deny the need for the physical data that appears on capital equipment cards but I do feel that product information is also needed.

Let us examine the effects on maintenance costs when the plant engineering organization becomes product oriented. If I were examining a machine *without being product oriented* I would examine only bearings, drives, moving parts from the viewpoint of replacing them when they were worn. I would also look for weak points where breakage might occur. All this can be done without product or performance data.

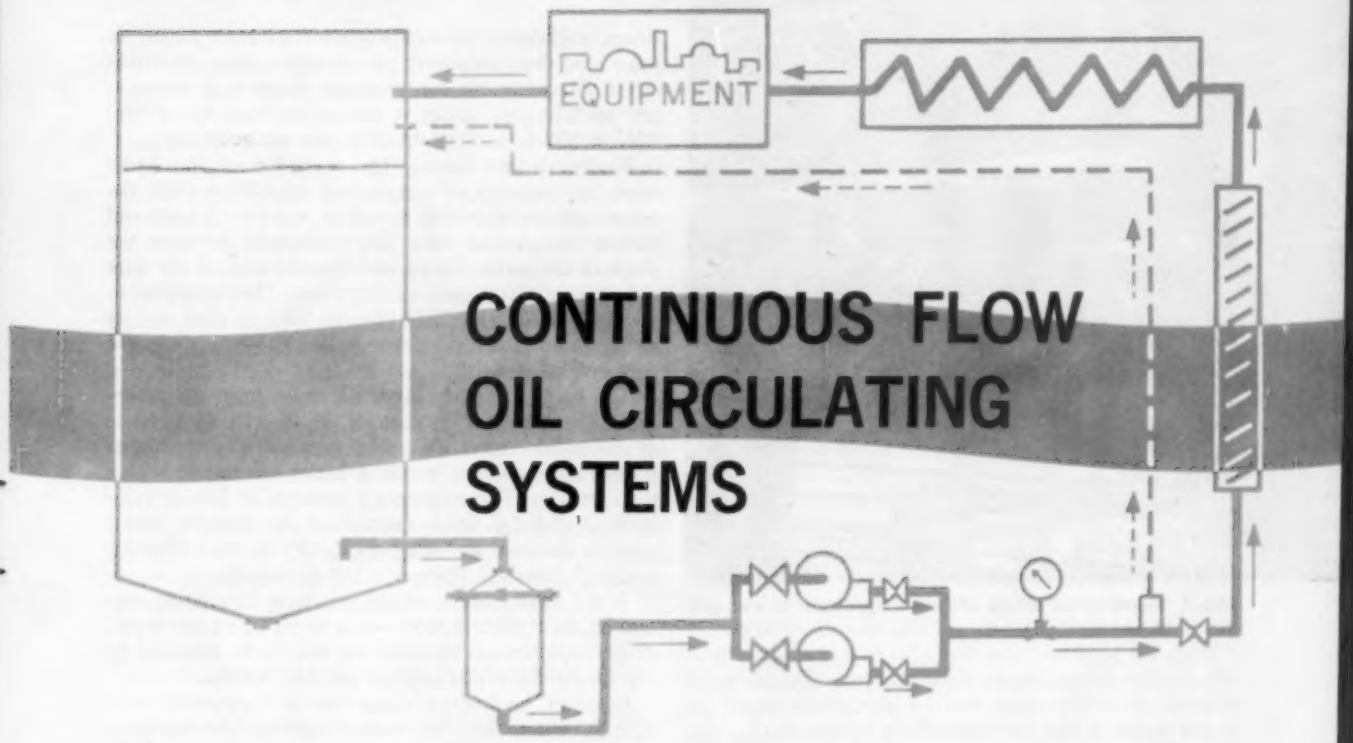
Now, if I were product oriented I would add product data to the capital equipment records. I would want to know the number of pieces to be produced per unit of time, what and how much material was being fed into the machine and whether or not it has an abrasive or contaminating effect on the machine. I would want to know the location of adjustments necessary for input piece tolerance and wear. In short, I would want to become familiar not only with the product but also with the raw materials that go into it.

How about waste or loss in production? Can I assume that for each set of parts fed into the machine I will get one finished product? If not, what is the loss? Can it be attributed to machine wear or malfunction? In many production operations an output factor is employed to portray the difference between the designed output and the actual number of assemblies produced. Production must also provide the sales department with a statement of ability to produce.

Consider the increased productivity and cost-savings that can be had if the machines can be maintained to close the gap between designed output and actual output. It is not, for example, an uncommon practice in industry to start 25 per cent more pieces through an assembly line than one expects to get off the other end. The question is: Can we, through the medium of better engineered maintenance, reduce this percentage of rejects? Answers are often found in reports not always routed to plant engineering: quality control reports, production downtime reports, standard cost data and machine yield reports.

In some industries adverse atmospheric conditions in which machines must operate are an accepted evil, such industries are generally in the heavy chemical or mining groups. In those plants where activities are generally confined to indoor areas dust and air-borne contaminants are not a severe problem. However, one factor that is often overlooked even in these plants is the effect of changing temperature and humidity on machine accuracy. It might be well for any plant engineer to appraise the plant equipment to determine whether or not such changes affect the product from start-up to maximum heated or cooled condition.

Do you evaluate the cleanliness of your equipment by its outward appearances? Such evaluation may not give you an accurate gage of the equipment's actual condition. I recall visiting one plant where the machinery looked spotless. Later I discovered that the dirt was removed regularly with the help of a high-pressure air hose. I can only imagine the damage that could have been done by the dirt and grit that was forced into close-tolerance bearings and fits. **End**



CONTINUOUS FLOW OIL CIRCULATING SYSTEMS

By J. PHILIP WETTACH, Manager, Mill Lubrication
Dravo-DeLaval Oil Systems, Dravo Corp.
Pittsburgh, Pa.

OF THE TWO MAIN TYPES of continuous flow oil circulating systems, one is designed for the lubrication of moving parts—gears and bearings, etc.—in heavy equipment. The second applies mineral oil, soluble emulsions, or other oil-base coolants to the cold rolling of metals.

Distinguishing oil circulating systems from other forms of centralized lubrication is the return of the oil to a central reservoir after application. Automatic reconditioning of the oil then takes place, permitting its continual re-use.

Here, basically, is a review of what is involved in obtaining reliable lubrication through continuous flow oil circulating systems:

The average oil reservoir is designed to allow the oil to settle for 30 minutes with the system in full operation. Thus, a system operating at 100 gpm is provided with a 3000-gal capacity reservoir.

Settling time varies according to the type of equipment being lubricated and viscosity—the heavier the oil, the longer dirt and water takes to settle.

On "wet mills" and paper machines it is advisable to have two oil reservoirs for the same system. One reservoir is by-passed for a week while the system operates on the other. By raising the temperature of the oil in the idle reservoir to between 160 and 180 F viscosity is lowered, permitting more rapid settling.

Designed with sloping bottom and equipped with baffles—both for the purpose of directing water and contaminants to low points for removal—the reservoir also contains steam heated pipe coils. Plate heating coils and electric immersion heaters are also used to maintain oil temperatures at desired levels.

A floating suction line ensures that oil containing a minimum amount of contaminants is pumped into the system at all times. The reservoir is also equipped with dust-proof hinged access doors, oil level indicators and alarms, test connections, temperature controls, and the connections needed for pump suction, oil return, and venting, as well as centrifuge connections.

In systems delivering coolant for cold rolling operations, the reservoir is sometimes fabricated with trash screens and with compartments for clean and dirty oil. Oil is filtered or purified before advancing to the clean oil compartment for re-use on the mill.

The average system has two main circulating pumps —either gear or screw type positive displacement rotary pumps. On roll coolant systems, where much larger volumes are involved, a centrifugal pump is usually specified.

Each pump will deliver the full system capacity. If, for some reason, one main pump falters or fails, the second will automatically start up after an alarm warns the operators of the faulty condition.

The pressure tank backs up the two main pumps. Complete with oil and air connections, liquid level gages, pressure switches and safety valves, the pressure tank is piped into the main discharge header of the oil filter. If both main pumps should fail, compressed air in the tank will expand and supply a small amount of oil to the equipment while the low pressure alarm is sounding. This is of special advantage on hot mills and paper machines: stock can be cleared through the equipment before a complete oil failure occurs.

In general, filters remove foreign material from the

Fig. 1. Signal panel warns of low oil pressure in the mill.

oil; purifying equipment separates two liquids, as in removal of water from oil. In particular, these are at the heart of the continuous flow oil circulating system: if contaminants escape the filtering equipment, the entire purpose of the system fails. Filtering is on a full-flow basis, while the purifying of the oil is usually on a by-pass basis at a lower capacity.

Filters for Excessive Contamination

The filters most frequently used in continuous flow oil circulating sytems are as follows:

Automatically cleaned filters are used principally in the steel industry for the gear and bearing lubrication systems. One type is made of wheel shaped discs of two different diameters. Stacked alternately one upon the other within a metal cartridge, they form a positive metal edge barrier providing slots of from 0.0015-in to 0.005-in. Pressure forces the oil through the metal cartridge, but particles from 40 to 125 microns in size are stopped at the slots. This is referred to as edge filtration.

Cleaner blades stacked parallel to the discs fit the slots and clean out contaminants as the cartridge is continuously revolved. Contaminants drop to the filter's sump for removal. Pressure loss is from 2 to 5 psi.

Another filter in this category uses a screen type cartridge with a cylindrical brush to remove the dirt.

Strainers: Double basket strainers are used as a main filtering element both in the oil cellar itself and also near the equipment being lubricated. As the lubricant flows through only one basket at a time, the other can be manually cleaned without shutting down the system. The strainer frequently comes with 100 by 100 mesh baskets with 0.005-in. openings and a magnetic element to remove metal particles from oil.

Cartridge-type filters are used mainly on paper mill lubrication systems and as polishing filters for coolant systems. The cartridges are resin-impregnated wool fibers, cellulose, resin-impregnated pleated paper or laminated discs contained in a housing with removable cover. They remove contaminants down to 2 microns; are used for oil having a maximum viscosity of 900 SSU at 100 F; and, when dirty, are replaced.

Backwash-type filters: The cartridge of the backwash filter consists of a stationary cylindrical cage, the outer surface of which is cut as a screw thread and wound with round wire. The difference between the pitch of the screw thread and the diameter of the wire determines the degree of filtration. This may be as small as 0.0025-in. This type of filter is used mainly as roughing filter on coolant systems, where excessive contamination exists.

The backwash filter takes its name from the cleaning action. A small portion of the filtered oil is taken at the outlet connection and pumped at slightly higher pressure to a slowly rotating backwash nozzle within the cartridge. The momentary reversal of flow is sufficient to dislodge solids throughout the element. These settle in the base and are periodically drained. Floating sludge is removed through a top blowdown.

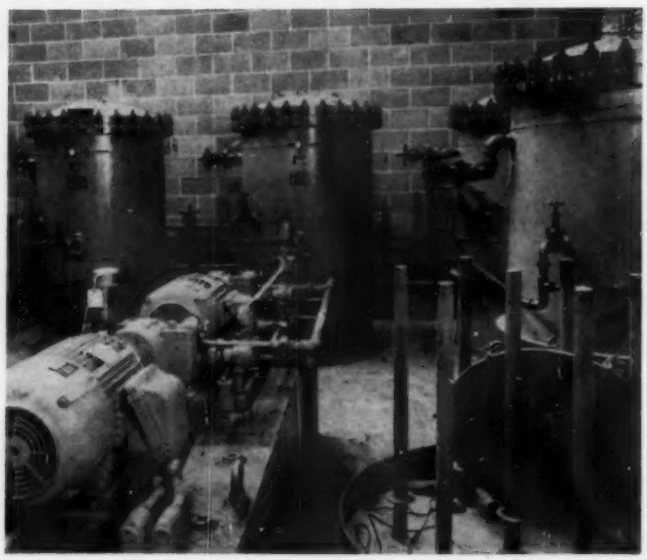
When examination of the oil in a circulating system shows contamination—as a result of excess water, or perhaps foreign particles too fine to be removed by the filter—the centrifugal oil purifier is used.

In effect, centrifugal separation is a powerful sidewise substitute for the force of gravity. As the most heavily contaminated oil sinks to the bottom of the reservoir, it is drawn off at this point, fed to the centrifuge, purified, and returned to the reservoir for re-circulation.

The centrifuge method is particularly important in the case of an emulsion, where water is distributed through the oil in such fine droplets that gravity cannot cause perceptible movement. Tremendous centrifugal force will remove them. Similarly, the centrifuge will remove contaminants too fine for the filter or for settling in the reservoir by gravity force.

In some applications it is necessary to remove fine

Fig. 2. Fullers earth filters neutralize acids in coolant.



abrasive solids and such oxidation products as gums, acid, and resins from the oil. The condition is encountered in coolant systems used in cold rolling of metals.

For these applications, use is made of a filter equipped with cartridges filled with Fullers earth which removes impurities by adsorption. Another filter used for this application is the pre-coat type which uses a combination of diatomaceous and Fullers earth. Fullers earth is recommended primarily for straight mineral oils because of its tendency to adsorb the additives in inhibited oils. Capacities range from 10 to 10,000 gpm.

In some installations the heat that is removed from equipment being lubricated is dissipated in the oil return lines and in the main oil reservoir. However, excessive heating of the oil may occur as a result of turbulence, or exposure to heat conducted from an outside source, as in hot mills and paper machine dryer sections. In this situation, a heat exchanger is used to cool the oil to the desired temperature.

After lubricating oil is filtered, it passes through the shell side of the exchanger or cooler while the cooling water passes through the tubes. This is often reversed in the case of lighter coolants.

Controls Maintain Desired Temperature

Controls on the oil reservoir and heat exchanger hold the oil to desired temperature, averaging from 95 to 110 F. A 24-hour record is kept of the oil temperature as it is supplied to equipment. This checks both the accuracy of the cooling equipment and enables operators to trace equipment failures that may be due to excessive oil temperatures.

Electrical controls other than those controlling motors and similar electric equipment include float switches to indicate oil levels, pressure switches to control the pumps and supply line pressures, audible and visual alarms, and main control panel.

A back pressure relief valve is tied into the line between the filters and the oil cooler. This holds main line pressure to predetermined settings.

After delivery to the equipment at the proper temperature, pressure and volume, the oil must then be applied. Many different methods of application are used. Here are some of the common ones:

In a majority of cases bearings receive oil by means of a sight feed. After the oil is metered through a needle valve in the sight feed, it can be seen through the opening provided. Since the oil must flow from the sight feed by gravity it is usually located above the bearing. When this is not possible, a rotometer or an orifice may be used.

In spray lubrication of gears, the spray orifice itself can be sized to regulate the oil flow. Usually a sight flow is used on a main line feeding a number of sprays to give an indication of proper oil flow. Rotometers and sight flows can be added to actuate the low-flow alarm.

Another common method of application contains no visual indication of oil flow to the equipment. In this a spray orifice is used for each gear mesh and a metering orifice for each bearing. A dual strainer is placed adjacent to the equipment. This is followed by a pressure reducing valve. The individual orifices are checked for flow, with pressure adjusted as desired at the valve.

The pressure reducer is usually set at from 15 to 20 psi with the oil at 100 F. Thus with pressure upstream of the reducer at 45 psi, a drop of 25 to 30 psi in the main system pressure could occur without disturbing proper flow to equipment.

Circulating systems are sometimes used on equipment utilizing the splash bath method of lubrication. Principal requirement here is maintaining the oil at the level for proper submergence of rotating parts as the oil is continuously renewed.

The responsibility for successful operation of continuous flow oil circulating systems is usually split two ways—initial design and engineering of the system, and thoughtful maintenance after installation. **End**

Fig 3. Centrifuge method is used to purify circulating oil.

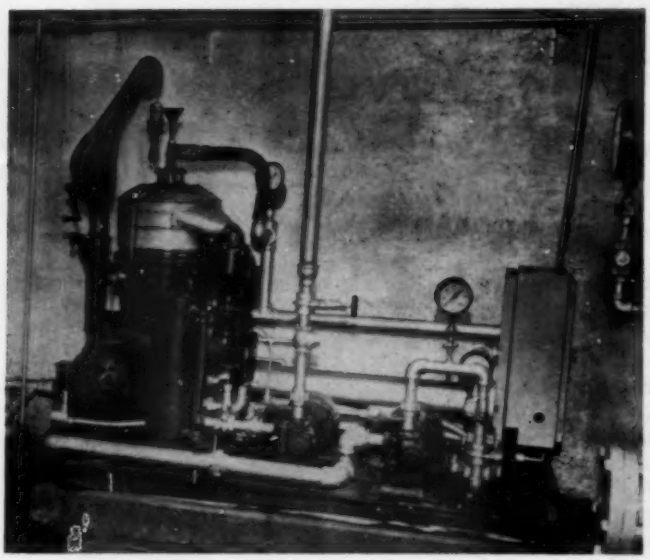


Fig. 4. System has pumps, filters, reservoir, heat exchangers.

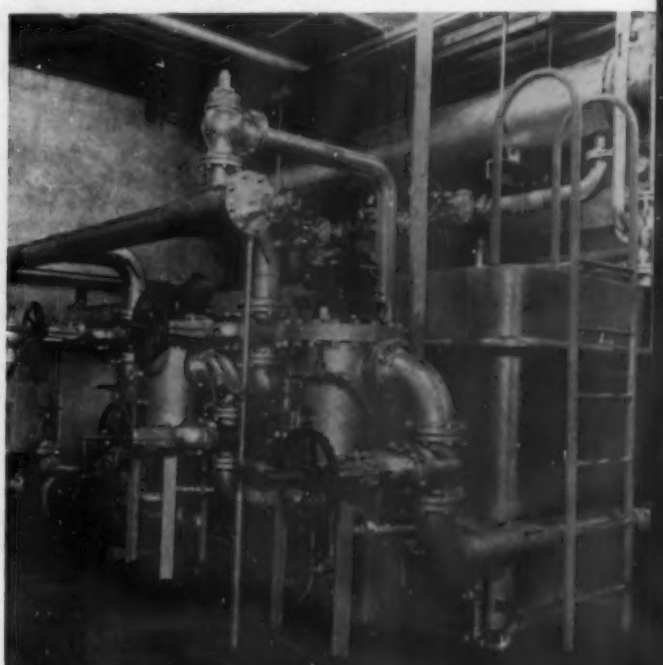


Fig. 1. Night view of plant. Glass panels give cafeteria an airy effect. The curtain wall incorporates aluminum.

HOW CLEAN CAN YOU GET?

This superprecision ball bearing plant provides an answer to this question by special provisions

By J. J. OTTAVIO, Factory Manager, Barden Corporation, Danbury, Connecticut

CLEANLINESS BEGINS in the boilerroom of the new precision ball bearing plant of the Barden Corporation, Danbury, Connecticut. Since the product is an intricate assembly of superprecision parts held within tolerances measured in millionths, a particle of rust, dust, or foreign matter in an assembled bearing could cause the malfunction or failure of the mechanism in which it is mounted. When this mechanism is a sensitive gyro at the heart of an inertial guidance system for a missile, the reason for the almost fanatical emphasis on cleanliness at Barden is quickly apparent.

The plant was designed by the Stamford, Connecticut architectural firm of Sherwood, Mills and Smith. Fitted to the contour of the land on the 21-acre site, the two-story, 135,000 square-foot building has all production departments on the main floor, with employees and building services on the ground floor.

Work on the production floor flows in a U-shaped pattern bordering a core of tool and gage rooms, machine maintenance and other manufacturing services. The first leg of the "U" is parts manufacturing, made up of machining, precision grinding and finishing operations; the final leg, which is sealed from the manufacturing area, contains final inspection, assembly, cleaning

and functional testing. It is here that the requirements for cleanliness are most stringent. While this area is guarded by its own immediate precautions, the total cleanliness effort begins on the floor below with such services as air filtration, cooling and heating, compressed air, cleaning solvents, coolants and the central vacuum system.

Water from the city of Danbury is piped to a 6000-gallon tank in the tank room on the lower level of the Barden plant. It is fed under pressure to points of use throughout the building. Water heated by two 250-hp oil-fired hot water boilers is piped throughout the plant for use in heating, air conditioning, and the cafeteria kitchen. Water from a separate 1000-gallon tank in the boilerroom, heated to 150 F in the boilers, supplies domestic hot water for washrooms and other plant needs.

Comprehensive fire protection measures were built into the new plant because of its hilltop location and the absence of city fire hydrants at the site. City water piped to two 9000-gallon tanks in the tank room is stored under pressure at 125 psi, to serve as a standby supply for the plant sprinkler system and fire hydrants around the periphery of the building. Piping from the supply tanks connects to a riser for each of four sprinkler zones. Each riser also connects to underground piping outside the plant to feed the fire hydrants.

Fig. 2. Flexible hose attached to a wand is connected to central vacuum system.

The supply line to the underground piping extends to the pump house, located 400 ft from the plant and adjacent to the emergency water supply, a 300,000-gallon concrete-lined reservoir filled from the city water system. In the pump house, a standby 50-hp diesel engine drives a turbine pump to deliver 1000 gpm at 140 psi. Pump operation starts automatically when electrical power goes off or water pressure in the fire system main drops below a preset level.

In an emergency, the standby tanks supply the sprinkler system until the turbine pump takes over. Fire engines can also pump directly from the reservoir. A check valve

Fig. 3. Exhauster (arrow) draws air through separator at left.

Fig. 4. The vacuum system is also used to clean boiler tubes.

at supply tank outlets prevents reverse flow of water into tanks from the underground piping. Once each week the turbine pump is operated for a half hour and a detailed check is made of the entire fire protection system.

Vacuum System Connections

A 15-hp vacuum producer is located in the tank room and connected to 30 floor valves at locations in the superclean areas. See Fig. 3. Cleaning hoses and wands attached to the floor valves are used daily to collect any dust that may have entered the area despite all other safeguards. Vacuum lines also extend to work stations in the assembly areas for product use such as picking up small parts. A separator also in the tank room, collects dust and dirt at a central point for easy disposal.

Vacuum lines also run to the boilerroom, with outlets for attachments to clean soot from the boilers. See Fig. 4. An additional separator in the boilerroom obviates the need for conducting soot back through lengthy pipes to the main separator in the tank room.

Cleanliness is a direct contribution to precision manufacture in the case of coolants which are cleansed of metal chips and other impurities that could prevent grinders from holding the very close tolerances demanded. For optimum cleanliness and dimensional control, the new plant utilizes three separate coolant systems for all machines, rather than individual systems for each machine.

Fig. 5. Filters, pumps, and piping for handling solvent stored behind the wall.

Tanks, filters, and sludge removal equipment for the coolant systems are located in the central coolant room on the lower level. One of two water-base coolant systems is refrigerated for use by centerless O.D. grinders and also by high-frequency grinders where surface speeds are extremely high. These systems have water meters for accurate control of amount of water used in making up coolant solutions; the third system handles a soluble oil coolant.

To avoid a maze of overhead piping with feeders down to the many machine tools in the manufacturing area, distribution piping from central systems is run to an exterior wall where it branches out to rows of low stanchions servicing the various machine areas. See Fig. 6. Piping supported by the stanchions provides such services as compressed air, water, coolant and hydraulics.

The stanchions also support ducting for electrical power, conduit for 1500 and 1000-cycle current for high-frequency grinding spindles, and 110-v regulated current for gaging equipment. Other advantages of the stanchion system are short machine hookups and considerable flexibility for relocating machines.

Cleaning solvent is stored in a 6600-gallon tank buried outside the building from which it is pumped through filters to a 550-gallon fireproof masonry-enclosed supply tank in the central coolant room. See Fig. 5. Filtered solvent is piped directly to certain manufacturing areas for use in non-critical production processes such as tumbling and lapping. For use in the superclean area, the

Fig. 6. Stanchions support electrical bus duct, conduit, various service lines.

Fig. 7. Workers must take air showers.

solvent is pumped through a second set of filters, a magnetic trap to remove metal particles, and finally a third set of filters close to the point of use.

Why Triple Filtering

Triple filtering is a strict requirement before the solvent can be used to clean bearing parts and bearing assemblies. It is here that the tightest cleanliness measures are demanded, for the bearings that leave this area are heat-sealed in polyethylene and ready for the bearing user to install directly in such delicate mechanism as gyros, synchros and other devices for critical military and commercial use.

As a further assurance of cleanliness, the contents of the 550-gallon filtered solvent supply tank are pumped at the end of a two-week period to another tank of equal size for use by maintenance personnel. A supply of fresh solvent is then pumped through filters into the primary supply tank from the outside storage tank.

Compressed air is used for various manufacturing processes and for operation of high precision air gaging equipment; in the superclean areas it is used with the triple-filtered solvent for bearing cleaning. Particularly for the latter use, the compressed air must be free of moisture, dust and foreign matter to avoid contamination to the highly finished bearing parts and interference with the performance of the bearings when installed in a super-accurate mechanism.

To meet these requirements, the system utilizes compressors with non-lubricated pistons (to avoid lubricant contamination of the air), aftercoolers, moisture separators, dryers and filtration units.

Perhaps the most exacting specifications for all central services were those drawn for the air conditioning system. Within the plant, the most stringent requirements were for the superclean area. Here filtration and electrostatic cleaning were specified to provide air that has no dust or foreign particles larger than a few millionths of an inch.

The superclean area, which is sealed from the manufacturing area, is made up of two sections—"critical" for such operations as parts cleaning and inspection and "supercritical" for final operations such as bearing cleaning, performance testing and packaging.

Personnel in the critical area wear special lint-free smocks and caps and enter from non-critical areas through air locks. See Fig. 7. Parts and materials are transferred from one department to another through air-locked passages. Supercritical areas, in turn sealed from critical areas, have additional cleanliness requirements. Personnel, wearing lint-free smocks, caps and special shoes or shoe coverings, must enter and leave through air locks having high velocity air showers that dislodge dust from clothing. Double doors on material passageways are interlocked to prevent both doors being opened at the same time. See Fig. 8.

Space conditions in the critical area are controlled to maintain 75 F dry bulb ± 2 deg, 40 per cent relative humidity ± 1 per cent. This is accomplished by subcooling and reheating the air to the desired space condition. All air to this area passes through glass fiber filters.

Air entering the supercritical area is filtered three times. First, air passes through glass fiber filters then is filtered by an electrostatic air filter which has a capacity of 5000 cfm and an efficiency of not less than 90 per cent, as determined by the National Bureau of Standards dust spot test. Finally, the air passes through Absolute filters which have a minimum 99 per cent efficiency.

Temperature Drop Alarm

Temperature and humidity in the supercritical area are controlled to the same settings as the critical area, except that temperature tolerance is ± 1 degree instead of ± 2 degrees. In the event the temperature drops below a predetermined level, an alarm bell rings. Continued drop in temperature would result in shutdown of the air supply to the area to prevent coil freezing in the affected air handling unit.

To inhibit the circulation of airborne dust in critical and supercritical areas, movement of air by

(Continued on page 216)

Fig. 8. The inside door must be closed before the outside panel can be opened.

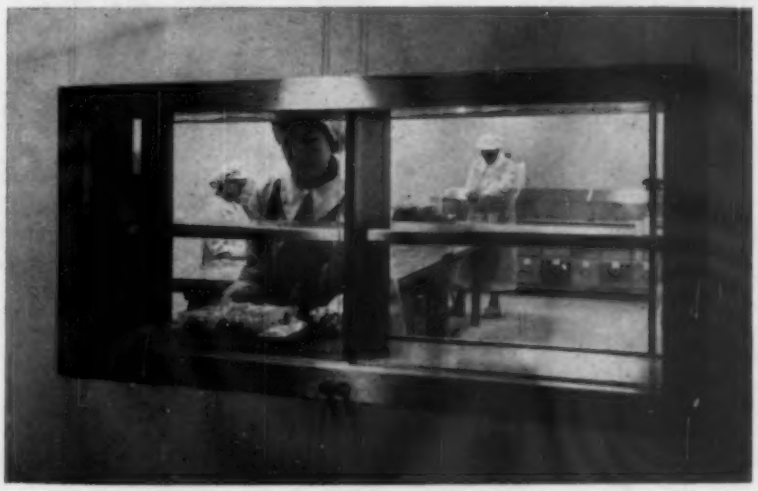


Fig. 1. To check compressor pumping time within an elapsed time period, the clocks are synchronized and the compressor is put into operation. One clock is tied-in electrically to unloading system and runs as compressor pumps.

AIR LEAKS GAGED BY THE CLOCK

Corrective Measures Reduce Losses

By J. R. HAUGAN, Assistant to Works Manager, Union Special Machine Co., Chicago, Ill.

IN OUR NORMAL manufacturing operations we have, through the years, required a considerable amount of air. We have found that on a fairly periodic basis, we were faced with the problem of making a decision as to the need for buying additional air compressor equipment because the pressure could no longer be maintained with the present equipment apparently due to increased demands.

This usually resolved itself into a repetitive series of questions by the plant engineer. Consequently, the maintenance foreman in charge of this portion of the maintenance work would reluctantly send one or more men through the plant, preferably on the night shift or when the equipment was not in operation, to find the biggest air leaks.

The procedure was to equip one or more men with a kit containing air nozzles, clamps, hose, and necessary tools to make the replacement. Most of the repair work was done during the day when the plant was in operation, causing some difficulty in locating the leaks because of the high shop noise level. There also was considerable discussion as to what constituted a "good" leak or a "bad" leak and at what point a leak should be tolerated or should be fixed. The final results always seem to be that when the leaks were cured the 250 cfm compressor once again was large enough to handle the load.

In order to avoid these periodic wrangles over air leaks and compressor equipment, the maintenance foreman decided to send mechanics through the shop on a periodic basis detecting air leaks. This was found to be unsatisfactory because it was difficult to determine when enough leaks had developed to make a trip through the plant pay and there was always the tendency to "put it off".

Going through this process repeatedly, brought us to the final conclusion: A simple way was needed to determine the point at which leaks were of sufficient proportion to make repairs economically feasible.

The method devised was quite simple. It consisted of two ordinary electric wall clocks which were fastened to the control panel in the boiler room. See Fig. 1.

One clock is connected to an a-c source and permitted to run continuously. The second clock is connected to the same a-c source but through the unloader circuit of the compressor presently being used. The procedure is as follows:

Every weekend when the shop is

not in operation, the attendant on duty in the boilerroom is required to set both clocks to twelve o'clock noon at the same time. At this point he starts the compressor, letting it run for one elapsed hour as indicated by the continuously running clock.

The second clock, of course, starts and stops, running only when the compressor is pumping and is stopped when the compressor is operating "unloaded". The net result is a simple measure of minutes of running time out of every hour required just for the purpose of pumping enough air to satisfy the leaks in the system.

Having devised a simple method of measuring the "relative percentage of air leaks", we set about to determine an acceptable maximum standard. The way to do this was obvious. A concerted effort was made by the maintenance foreman to correct all possible air leaks. This was done by having a man check the system for leaks each night and over the weekend for a period of several weeks, correcting during the day time the defects that were located at night when the plant was quiet.

Each weekend, the ratio of pumping minutes per hour was determined by the use of the two clocks. After a period of four weeks when no more leaks could be discovered and corrected, the minimum pumping time was found to be approximately four minutes. Having now established the fact that the system was as tight and as good as we knew how to make it, the compressor needed to pump four minutes out of every sixty in order to hold up the pressure. We, as a rule of thumb, added 50 per cent or two additional minutes and agreed that whenever the pumping time was more than six minutes the time had arrived to go through the plant again to detect and cure air leaks.

Our weekly procedure now is for our boilerroom attendant to make a standard reading and report to his foreman in writing. Now a trip through the plant to detect leaks is made only when the pumping time for leaks exceeds six minutes per hour. We have also found that the boilerroom attendant usually has enough time over the weekend to go through the plant using his "ears" to detect the leak which he can readily hear when the plant is shut down and can often make his own repairs as he finds the leaks.

Major Leaks Reported

Where repairs are more than he can handle, he notes the location. To his foreman he turns in a report on the minutes of pumping time, number, location and type of leaks he has found. We no longer have wrangles over air leaks or compressor equipment requirements. When our compressor is now fully loaded, we know it is due to air usage rather than air leakage.

It might be interesting to also make a few observations with respect to the causes of the leaks we found. Our plant uses compressed air for clamping devices, for gaging and for pneumatically operated devices which operate at 90 to 100 psi. We also have blow guns which are used for cleaning chips out of fixtures, etc.

In years gone by, these blow guns were also operated at 90 psi. The standard procedure was to insert a ¼-in. size fitting into the ¼-in. ID rubber air hose. This adapter was clamped in the hose by means of an ordinary wraparound hose clamp and tightened by means of a bolt and nut. Some problems were:

1. The air hose was not oil-resistant and tended to become "soggy" and soft where the operators oily hands constantly came in contact with the hose.
2. The deterioration of the rubber caused the blow guns to be blown out of the hose periodically by the air pressure.
3. The edges of the hose clamp were often sharp and had to be wrapped with tape in order to prevent cutting the operators fingers.
4. The general belief was, "the larger the hole, the more air". The tendency was for the operator to grind off the tip of the nozzle which would enlarge the orifice in the tip to approximately ⅛ or 3/16 in.
5. The triggers leaked and even though no air leaked through the nozzle, considerable air leaked past the trigger.

Corrective steps

1. We combed the market to find the least expensive neoprene air hose so that the oily hands of the operator would not deteriorate the hose.
2. Largely because of experience in other plants, we divided our air system into low and high pressure. High pressure air (100 psi) is now reserved for gaging, clamping devices, etc., while low pres-

(Continued on page 218)

Fig. 2. Typical regulator for reducing air pressure for a gun.

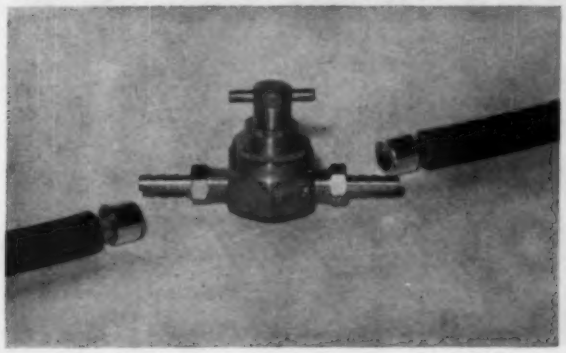
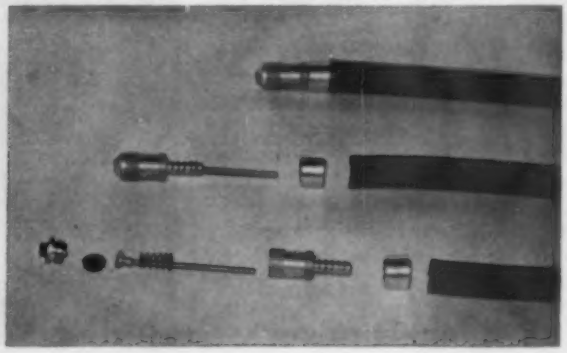


Fig. 3. Progressive disassembly of gun of type used in plant.



Whether applied by a contractor or by your own plant's staff, plastisol coatings have certain inherent advantages such as inertness, lack of porosity when properly applied, and low cost per year of effective life. Cost comparisons of dip vs. spray methods, and contractor-applied vs. in-plant applied methods help determine which methods to use

By L. I. SHEARS, Technical Director, Quelcor, Inc., Chester, Pa.

HOW PLASTISOL COATINGS CAN

MAINTENANCE COSTS of equipment subjected to corrosive atmospheres can be reduced by the use of tough, abrasion and chemical resistant coatings made from polyvinyl chloride plastisols. Three approaches are possible. 1. Contract application of dip coat. 2. Contract application of spray. 3. In-plant or do-it-yourself systems. Each has advantages depending on the type, size and number of the items to be protected. The savings achieved by the use of these coatings come from the longer life of the coated items and the fact that expensive special metals need not be used.

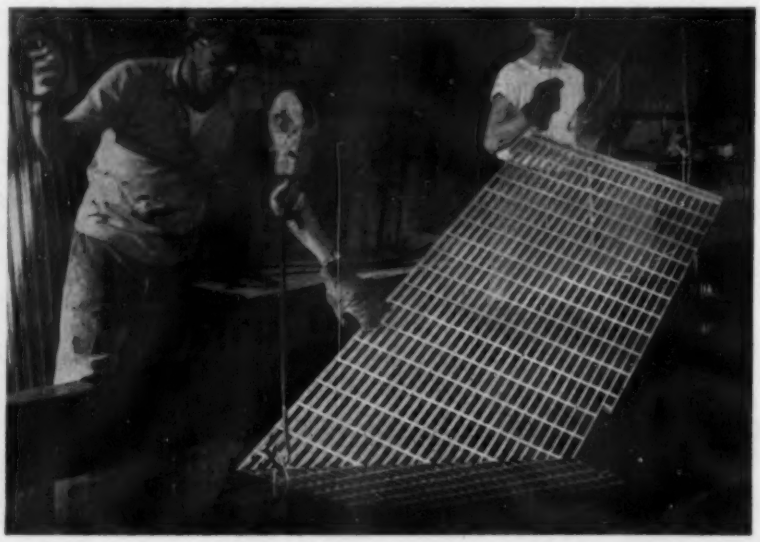
Corrosive atmospheres encountered in many plants are death to ordinary paints. Plastisol coating provides protection, not only against corrosive atmosphere and dilute acids and alkalies at temperatures below 180 F but it also offers outstanding abrasion-resistance. It can be used on structural members, floor grating, fume exhaust hoods and ducts, tanks, tank covers and pipes. In fact, its uses are limited only by the engineer's imagination and by the fact that it cannot be applied without in-plant facilities—either contractor's or owner's plants.

Generally, plastisol coatings are applied by contract applicators using either the dip or spray method. The procedure is either for the applicator to supply the coated item to the customer according to his specification or for the customer to send one or more pieces to the applicator for coating. In either event, most of the work is done by the dip method.

Dipping: After the metal fabrication has been completed, the parts are sandblasted, primed, pre-heated and dipped, while hot, into the plastisol. The plastisol flows evenly over all surfaces and into all undercuts and crevices forming a continuous non-porous casing entirely free of seams, joints or other possible points of chemical attack. The heat gels the plastisol to a coating thickness approaching the thickness of the metal. This stage is followed by an oven curing at temperatures between 350 and 400 F.

After the coating is completely fused, the part is allowed to cool and is then inspected for possible pinholes. A spark test is employed

Most effective method of plastisol application is by dip method shown here.



CUT COSTS

Spark test for pin holes in coating subjects every inch of surface to 10,000 v. If spark shows, the pin-hole area is marked, repaired and again subjected to the test.

which subjects every inch of the coating to 10,000 volts. Should a pinhole be present, the tester will spark through to the metal indicating the need for a repair. After the repair is made, the spot is again subjected to the 10,000 volt test.

Spraying: If the item to be protected is too big to be dipped or the customer wants only certain areas coated, then the spray technique is employed. Metal preparation is the same as for dip coating. The difference is in application only. The spray plastisol is applied to the cold metal.

Coating thickness is governed by the flow characteristics of the plastisol. Single coats of as much as 100 mils can be achieved. However, it is generally better to apply two thin coats rather than one thick one. The chances of pinholing are much greater with spray than with dip coating. With two coats, the possibility of pinholes occurring on top of one another are remote. The fusing of the plastisol and the following inspection and repairs are the same as described above.

Savings achieved by these plastisol coatings come from two sources. The first is measured by the cost per square foot per year. The second is intangible but none the less real. It is the savings due to the greatly reduced number of downtimes for rebuilding and the cost of preparation for rebuilding.

Comparisons of the costs of three specific contracts made with Quelcor, Inc. of Chester, Pennsylvania are shown in Table I. This table illustrates costs incurred by two methods of application.

Savings shown in the above table can be increased if the volume of items to be protected warrants the installation of an in-plant system. If it appears that more than 10,000 sq ft of equipment will require protective coating at regular intervals, one can be quite sure that such an in-plant system will be profitable.

Of course, the greater the area to be coated the more the savings. With an area of 30,000 sq ft or better to coat annually, the savings will easily pay for the installation and future jobs can be done for as little as 90 cents per square foot. Table II shows the cost of prepara-

Table I. Comparisons in cost between plastisol-coated and uncoated equipment including life in years and cost per square foot per year of expected life.

COST COMPARISON—DIP COAT	Fume Exhaust Duct		Stair Tread	
	Plastisol Coated	Painted	Plastisol Coated	Uncoated
Cost per square foot	$3.84	$2.23	$6.75	$3.10
Life in years	7 plus	2	7 plus	0.5
Cost per square foot per year	$0.55	$1.12	$0.97	$6.20

COST COMPARISON—SPRAY COAT	Carbon Steel Tank	Carpenter Steel Tank
	Plastisol Coated 150 sq ft	Uncoated 150 sq ft
Cost per square foot	$4.25	$11.50
Life in years	7 plus	7
Cost per square foot per year	$0.61	$1.65

tion, and application of coatings of various thicknesses. Table III illustrates possible savings inherent in an in-plant system.

Another example of the economy obtainable from plastisol dip coating is illustrated by the following cost figures:

Tanks lined, inside only, with 0.100 in. material on a contract basis, cost approximately $3.00 per square foot. Tanks, or other structures, coated both inside and out with 0.100 in. of plastisol coating, cost approximately $1.50 per square foot. In addition to the $1.50 per square foot difference in cost, the savings involved in not having to paint and maintain the outside of the tank is a substantial one.

What does an in-plant system include? Such a system can be purchased in a package to include all equipment, materials, technical advice, and training necessary. One can purchase as much or as little of the following service, equipment and materials as one needs.

Technical services available: engineering, product suitability, site adaptation, training of personnel, supervision in plant, and continuing technical service.

Equipment: sandblasting, spray booths, curing ovens, dip tanks, pumps, materials handling, inspection, repair.

Materials: metal cleaners, primers, PVC coatings. **End**

Table II. Cost of preparation and cost of plastisol coating by single-dip process.

	COATING THICKNESSES IN INCHES		
	0.050	0.090	0.125
Material cost per square foot	$0.55	$0.90	$1.25
Labor costs per square foot for metal cleaning, priming, dipping, curing and inspection. (Equivalent to 0.075 man-hours per square foot).	$0.15	$0.15	$0.15
Sandblasting charges per square foot, if needed	$0.20	$0.20	$0.20
Total cost of preparation and material—	**$0.90**	**$1.25**	**$1.60**

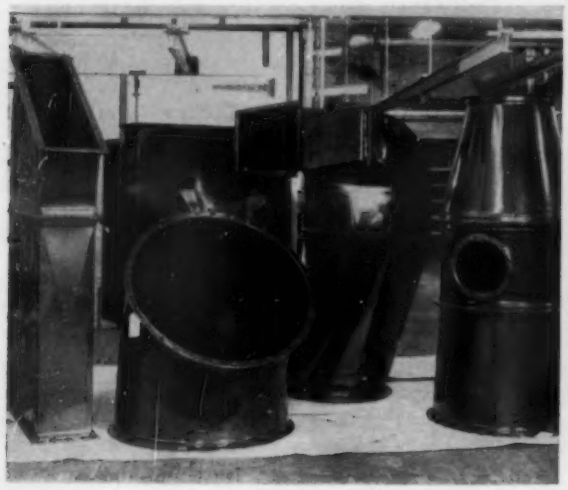
Notes: Coating thicknesses on all exposed surfaces obtained by the single dip process. Applicable overhead on labor would be added to above figures.

Surface area to be coated is obtained by measuring one side but coating both sides.

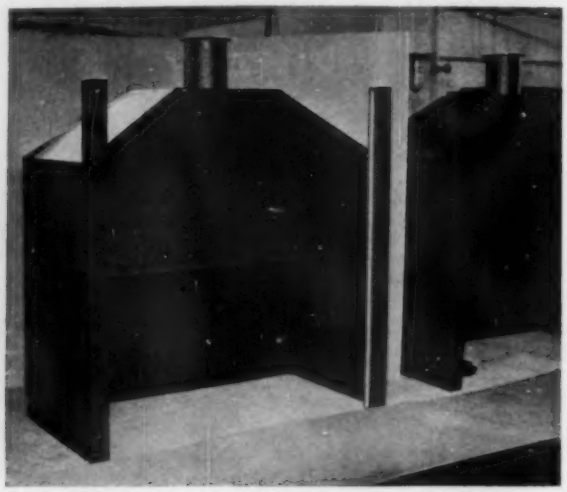
Table III. Estimated savings of in-plant system versus contractor application.

Expected annual cost of coating	10,000 sq ft	20,000 sq ft	40,000 sq ft
Expected annual volume of coating if done by contract application	$25,000	$50,000	$100,000
CAPITAL REQUIRED FOR IN-PLANT EQUIPMENT			
1. Machinery and equipment	$10,000	$12,000	$ 15,000
2. Initial plastisol to fill tank	$10,000	$12,000	$ 13,000
3. Installation costs	$ 3,500	$ 3,500	$ 5,000
Total capital required	$23,500	$27,500	$ 33,000
ESTIMATED ANNUAL OPERATING COSTS			
1. Material consumed	$ 3,740	$ 7,480	$ 14,960
2. Labor	$ 7,000	$10,500	$ 15,750
3. Depreciation, repairs, overhead	$ 9,560	$11,150	$ 13,780
Total operating costs	$20,300	$29,130	$ 44,490
POTENTIAL ANNUAL SAVINGS	$ 4,700	$20,870	$ 55,510

Parts to be dipped are first sandblasted, when necessary, primed, pre-heated, and dipped while hot, into plastisol.



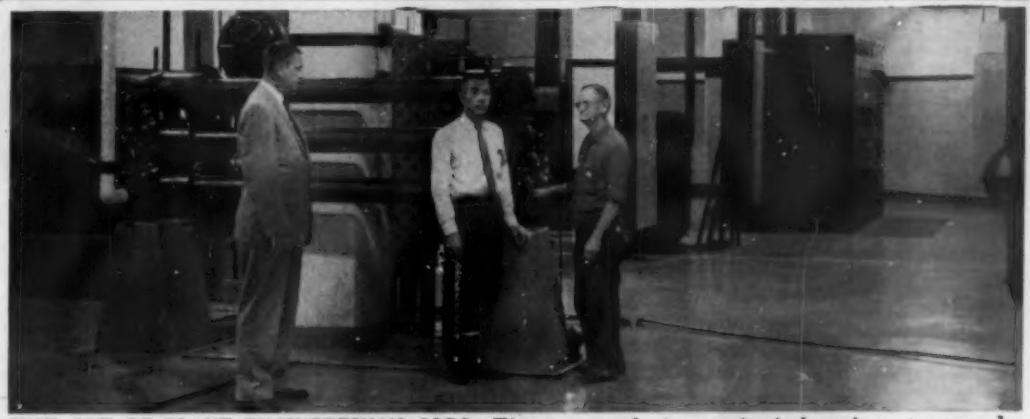
If item to be coated is too large for dipping, or only portions are to be protected, spray method is then employed.



DON'T KEEP IT A SECRET!

Do you let your fellow employees know what your department is doing to help them in their jobs? Plant engineers at the Georgia Division of Lockheed Aircraft Corporation do. They were recently the subject of the article, reproduced here, in the company newspaper, Lockheed Southern Star.

You can "tell the world" through your employee publication about your department's responsibilities and special accomplishments. Usually editors of company publications welcome such news, so why not make sure they know about your department?



JUST ONE OF PLANT ENGINEERING'S JOBS—This is one of nine mechanical equipment rooms located in the basement of B-1. One of Plant Engineering's jobs is to keep compressed air available at all times. Left to right, C. F. Griffin, foreman of plant utilities, 39-21; G. L. Sawyer, supervisor, and R. P. George, who is responsible for compressed air system on the day shift.

Rain or Shine, 24 Hours Each Day Plant Engineers Stay at Their Jobs

It matters not what time of day a person walks into the mammoth Georgia Division plant, he takes for granted the utilities that provide him with the comforts and conveniences of work.

Did you ever think who's responsible for seeing that there's water at the faucet, electricity in the lines, plenty of heat and ample compressed air when needed? Well, that gigantic task is performed by Plant Engineering. Despite the fact that members of this division are on duty .24 hours per day throughout the year, they carry on their duties efficiently and without fanfare. It is easy to assume that all this work just happens.

There are 110 mechanical equipment rooms in the plant area in which are located the necessary equipment to supply the facility with compressed air, steam, air conditioning, hot and cold water, gas, sanitary sewage disposal and industrial waste disposal.

The utilities necessary for the operation of the plant rival those of fairly large size cities. For example, it is estimated that during a normal working day the plant uses the following:

Compressed air	10,080,000 cu. ft.
Steam	2,068,200 pounds
Water	2,261,336 gallons
Sewage	1,920,000 gallons
Gas	78,816 cu. ft.

Typical of the men who maintain this operation is R. P. (Pat) George, who has been with Lockheed since 1951. The air compressors are his responsibility and he nurses them as if they were babies.

"Not a single one has burned out on me since I have been here," he proudly says.

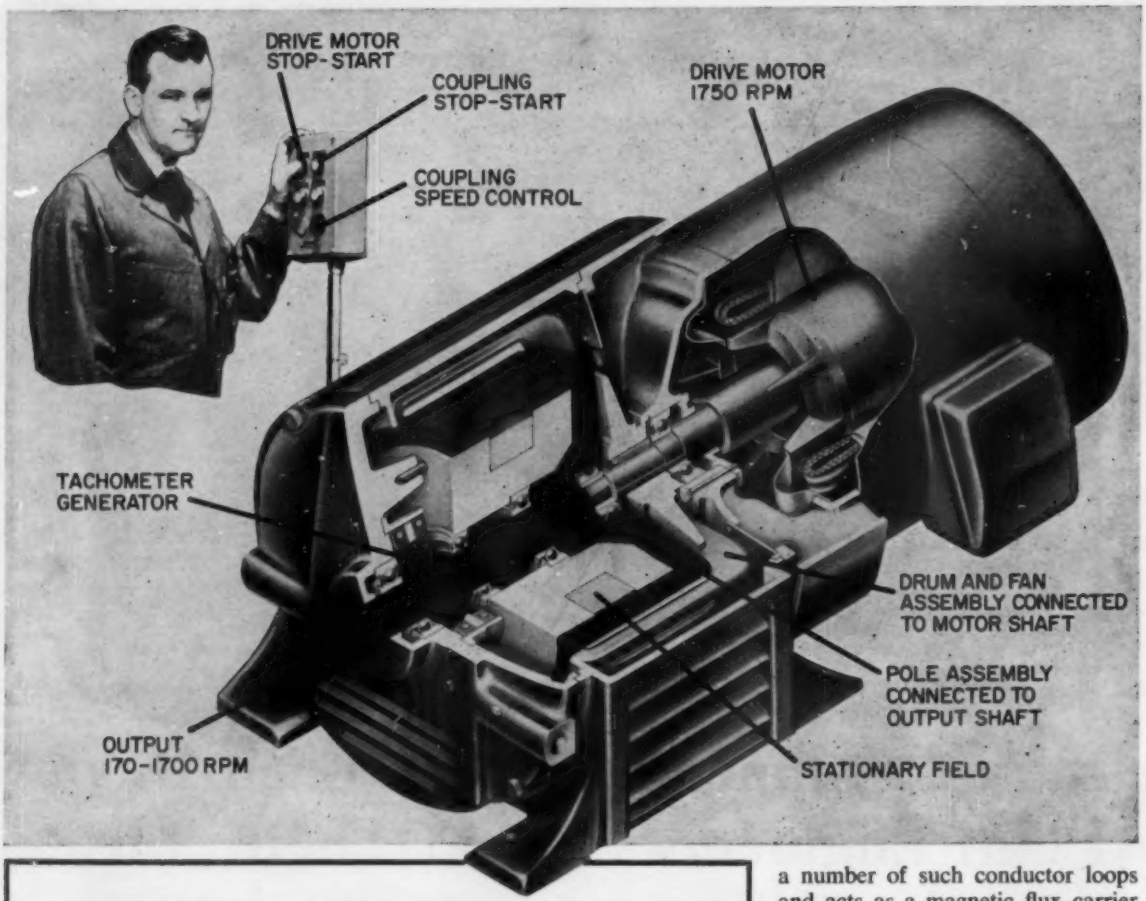
This is a tedious task because each of the compressors must be properly oiled and cooled and above all, their pressure must be constant with the others on the line. He has 12 compressors and two for emergencies.

To supply the plant with water, Lockheed connects with the Cobb County line and pumps the water into its four-million-gallon reservoir. From here it is pumped throughout the plant. The nearly two million gallons of sewage is pumped from the plant to Lockheed's sewage treatment plant.

The maintenance of the entire facility is divided into five departments under the direction of J. V. Saylors, general foreman of Maintenance. They include Electrical Maintenance, Max Jolley, manager; Mechanical Maintenance, A. L. Rambo, manager; Roads and Grounds, Marion Truslow, manager; Flight Line Maintenance, Joe Delany, manager and Plant Utilities, C. F. Griffin, manager.

So if you ever get the idea your job is rough, remember when others are opening Christmas gifts, attending Halloween parties, hiding Easter eggs or ringing out the New Year, your friends from Plant Engineering are working for you out at the plant.

EDDY-CURRENT DRIVE SOLVES SPEED CONTROL PROBLEMS



FEATURES 17 to 1 SPEED RANGE WITH 2 PERCENT REGULATION . . .

EMPLOYING eddy-current couplings, a new line of adjustable speed drives has been announced by the General Electric Company. Available in ratings from 5 through 100 hp, the units feature versatile performance and have a broad range of general purpose industrial applications. Called "Kinatrol", the drive is the culmination of more than four years of laboratory and field testing. It is being offered as a complete packaged drive including the drive unit, control enclosure and an operator's remote control station.

An eddy-current coupling is an electro-magnetic device that is used to obtain adjustable speed from a constant or variable-speed source. The output-shaft speed is adjusted by controlling excitation to the coupling field coil.

Operation is based on the principle that current induced in a closed-conductor loop by a rotating magnetic field reacts with the field to produce torque in the direction of rotation. A solid drum is, in effect, a number of such conductor loops and acts as a magnetic flux carrier as well.

Torque can be produced only when there is relative motion, or "slip", between the rotating field and the drum. For ventilation reasons, the drum is connected to the input or motor shaft and the pole assembly is connected to the output shaft. The torque transmitted between the drum and the rotating field increases with field strength and with slip speed.

For a given input speed, the speed of rotation of the output shaft will depend upon the load torque and the field strength of the magnetic poles. Since the eddy-current coupling does not provide torque conversion but only torque transfer, the output torque will be substantially equal to the input torque at all times. The difference between power input and output is absorbed

by the coupling and appears as heating of the magnet drum, plus some windage and friction loss. These losses must be removed by adequate ventilation to permit continuous operation.

Standard control enclosures are designed to contain the equipment necessary for starting, stopping and protecting the a-c motor and for exciting, regulating and completely controlling the coupling operation. The simplest regulator is of the half-wave thyratron type, but a static, non-tube type amplistat regulator is available.

Basic Torque Capabilities

Typical unregulated torque-speed curves for an eddy-current coupling are shown in Fig. 2. These curves show the basic torque capabilities at various excitation values and indicate the wide range of speeds and torques available. The basic characteristics are modified by the standard regulator to give substantially constant speed, Fig. 3. Only four of an infinite number of potentiometer speed settings are shown.

Automatic control provides close speed regulation as standard. On a typical friction load, regulation of two per cent of full speed can be obtained. This is accomplished by a voltage established by the speed-setting potentiometer. Excitation of the coupling is automatically increased or decreased as the output shaft speed rises above or falls below the set speed.

High frequency design of the integral tachometer generator allows greater simplicity and produces higher voltages to eliminate the need for voltage amplification. Windings and magnets are in the stator and are encapsulated for positive protection from electrical failures. No brushes are used and maintenance of this important component is virtually eliminated.

Ratings through 20 hp are capable of continuous operation down to 100 rpm at rated torque, providing a speed range of approximately 17 to 1. Full rated horsepower is available at the load as all drive ratings apply at the output shaft of the coupling, rather than at the output shaft of the a-c motor. A wide variety of drive and control features can be added to the basic unit to provide reversing, braking, low threading speeds, controlled acceleration and other functions.

Simple multimotor schemes are possible as the drives parallel easily for master-slave operation. The units adapt readily to constant-torque type dancer rolls, or programmed torque reel operation for simple winders. The inherent unregulated characteristics approach a constant-torque curve and are ideally suited for tension devices. Sizes through 20 hp will operate stalled continuously at rated torque.

Transient shock absorption is inherent in the drive as there is no mechancial connection between the input and output shafts. The a-c motor is started at no-load and application of coupling excitation provides a cushioned start. Control is readily modified to provide longer timed or torque-limit acceleration when this is required. **End**

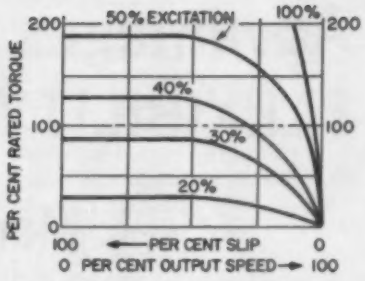


Fig. 2. Typical unregulated torque-speed curves for eddy-current coupling.

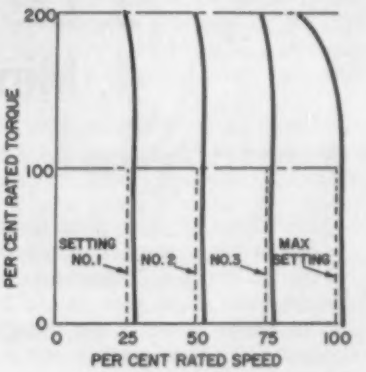
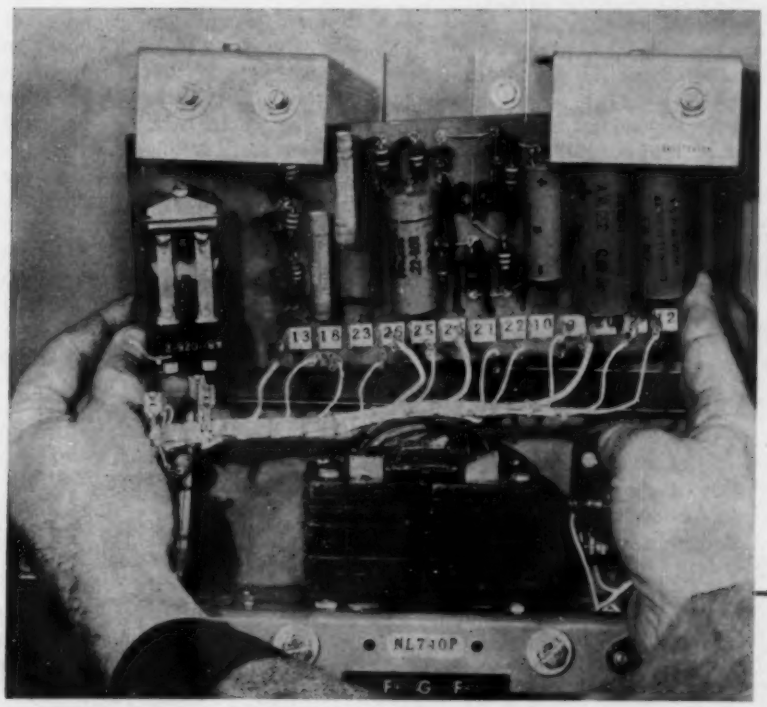


Fig. 3. Basic characteristics are modified by regulator to give constant speed.

Additional Information

If you would like more information about this eddy-current drive, just write to the Editor, Plant Engineering, 308 E. James St., Barrington, Illinois, or indicate "Eddy-Current" on the post card in this issue.



Plug-in component board in exciter-regulator can be changed in minutes to return drive to productive service. Spare board can be repaired in shop.

Advantages of FLEXIBILITY IN MACHINE LAYOUT

1. More production per employee
2. Less time for work in process
3. Less plant space per unit of product
4. Minimum movement of stock

By GEORGE E. McKEWEN, Industrial Division, Barry Controls, Inc.

FLEXIBILITY of machine layout has become extremely important in the last two years. Marginal producers today have been forced by lower sales volumes and hungry competitors to cut every penny out of shop costs to stay above water. Reductions in piece handling and distance transported are achieved only through better plant layout and lower cost per piece.

Just what are the objectives of a good layout? In our opinion they should be:

1. Arrangement of machines in the sequence in which the operations are performed.
2. Operation in smallest possible area to do the job.
3. Minimum movement of stock the minimum distance between press operations.
4. Utilization of the minimum number of men.

These objectives, if achieved, can help you solve typical high-cost hazards such as:

1. Too much handling of pieces, trays, or live boxes along your whole press line.
2. Too much back-hauling and cross-flows of pieces from one operation to the next.
3. Too much work-in-process inventory because of banks of work ahead of the next operation.
4. Too much space required for per-unit-product because of the needs of this work-in-process storage and handling.
5. Too much total time in machine area because of transportation of pieces.
6. Too much supervision needed because of more difficult production control and balancing out of sequential operations.

There have been many methods used to mount machinery. Years ago, textile companies would glue their looms to the floor using pads of high density mechanical felt. As these pads pulverized from the continuous, almost pure harmonic force motions, special solvents were used to remove the glue and a new pad glued in its place. Though the same material is still in use today, let's first consider those standard mounts which offer, in one form or another, a method for leveling without the use of shims.

This type of mount, made by several manufacturers, offers mobility because it is not lagged or glued to the floor. It is called a leveling machinery mount. Mounts may use a variety of different resilient isolation elements: felt, neoprene, wire mesh, neoprene bonded to cork, are all used by various manufacturers.

Different Leveling Methods

Methods of leveling are also varied: in one case, the machine rests on the leveling disc. By rotating the through bolt, the height of the disc changes and thus levels the machine. In another, the machine rests on the leveling nut, and by rotating the through bolt, the machine levels. A third method has the machine rest on the entire cover plate and is locked on the mount. Internal leveling is accomplished by rotation of the through bolt. Still another solution has the machine on the top of the mount; rotation of two side access bolts adjusts level of mount.

Application of isolators to lessen the effect of shock is difficult to discuss, partly because of the term itself. The term "shock" has no definite and accepted meaning: It conveys the meaning of suddenness, either in the application of a force, or in the beginning of a motion. There are three categories of shock. The first might be a variable momentum system, an example of which would be a drop hammer; the second might be a transient vibration, an example of which would be the transmitted shock forces going through the building structure at a forcing frequency usually at the natural frequency of one of the structure's members; the third, and the one we will discuss, might be a constant momentum system, an example of which would be a power punch press.

In this latter case, there is no over-all change in the system's momentum, but rather a change in the distribution of momentum within the system. Shock isolation in such a system consists of engineering isolators capable of permitting the necessary amount of motion, dictated by momentum transformation.

Design of isolators is difficult to apply without an elaborate analysis of the mounted machine. For this reason, a manufacturer of leveling machinery mounts, to apply his par-

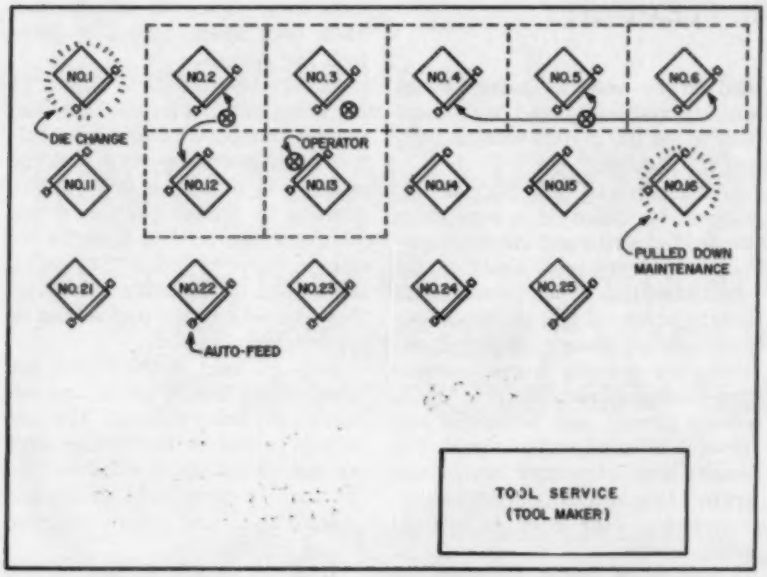


Fig. 1. Presses pulled down for maintenance, dies being changed or sharpened, jobs held up for quality check, minimize the plant space available for production.

ticular resilient element, must thoroughly engineer each mounted machine as a separate floating system. Hence, each unit must be analyzed from a reference of dynamic isolation, not static weight alone. This is essential to avoid trial-and-error application practices.

Recommendation Sheets

Recommendation sheets must be prepared in advance to assure satisfactory operating performance on a nationwide basis. These recommendation sheets are made available to the major machine tool builders and their dealers so that these protective "shoes" can be offered as standard accessory items.

Each of the various types of resilient cushions—felt, cork, metallic mesh, steel springs and neoprene has its own unique properties, high to low temperature operation, oil resistance, drift, aging, stiffness or deflection and damping. The user should be sure to select that material best suited for his application or, in the case of a power punch press, the material recommended by the leveling machinery mount manufacturer for the specific press to be mounted, considering such factors as compression loading, operating speeds and press stability.

One cannot ignore the desired operating stability of a machine tool when mounting on a resilient cushion. Any mounted system is a compromise between stability and degree of isolation desired.

Particular caution must be taken to avoid resonance in punch presses and similar machines having periodic operation. Substantial isolation is assured if the natural period of resonance of this isolated system is greater than that of the metalworking stroke. If the natural period of the isolated system coincides with the period between the operating strokes of the press, a resonant condition may result.

Improper application occurs where the metalworking "blows" or forces are taking place so rapidly that the isolating material does not have a chance to reach equilibrium. Thus it is storing energy from a second blow before it has released all of the energy from the previous blow. This condition is in the resonance area and often causes a mounted press to "walk".

Some years ago, a manufacturer held a staff meeting to discuss a 30 per cent expansion of its productive output. A new building and new punch presses were under consideration when a young project engineer, now president of his own company, interrupted with uninvited comments.

The company, he said, could increase productivity without getting new machines and without building a new plant. "Make the presses mobile. Use that mobility to maximize floor space. Rebuild and speed up existing presses."

In the pressroom, for example, were about 70 presses. On their better running days, less than 50 per cent of the presses would be operating. Normally, however, half of that, or 25 per cent, were operating. This condition is familiar—some of the dies may be out for sharpening, die sections are out for overhaul, press pulled down for maintenance, there is operator absenteeism or the job is held up for quality check.

A portion of their pressroom layout showing only 17 presses is shown in Fig. 1. Squares of dash lines depict the approximate floor

Steps required for installing machines by bolting, by using leveling mounts.

Steps Used In Original Installation Of Machines

Bolting Machine To Floor	Installing Machine With Leveling Mounts
1. Lift machine	1. Lift machine
2. Move it in place exactly	2. Attach leveling mounts
3. Mark location of holes	3. Move machine in place
4. Lift machine	4. Adjust leveling screws until level
5. Move it out of the way	5. Tighten check nuts
6. Drill holes	
7. Sink anchors	
8. Lift machine	Two men at ¼ hr each
9. Move it in place exactly	
10. Shim press till level	
11. Insert bolts and tighten	Two men at 4 hr each
12. Check level	

area needed for operation of each of the presses shown. Area is available for the press itself, auto feed units, live boxes, stock storage, operator and a portion of aisle space. Presses Number 2 and 12 are serviced by one operator, presses Number 3 and 13 each have their own operator. Presses Number 4, 5 and 6 have but one operator. Press Number 1 is down for die change. Number 16 has been pulled down for maintenance of press or die. Forty per cent of the presses are being run by four operators and two presses are being serviced. The balance of the presses are not on the day's schedule.

Use Imagination

This young engineer knew he could, with intelligent layout, store four presses in the space occupied by one press that was bolted in its operating position. "Why store presses in the middle of a line?" he asked.

He knew the die setters and tool makers had proved over and over again that they were more efficient when working in their own shop, so he asked, "Why maintain presses and dies in the middle of a line?" It became obvious, with study, that he had to be able to move presses quickly and easily and have some way to set the presses without bolting them down.

After several do-it-yourself attempts, he called in specialists in the field of shock and vibration control. These engineers analyzed the static condition of the presses' total weight, center of gravity, weight per foot, the operator's required stability, the dynamic forces, momentum changes, metalworking cycle, energy storage, and horizontal and vertical isolation requirements. The results were laboratory proved and refined into specific isolator recommendations for each individual press.

This plant began to equip its secondary presses with leveling machinery mounts, add air and electrical quick-disconnects and plan the new layout and operations. The results were as gratifying as the speed with which they were able to implement their plans. As the plans unfolded the same portion of their layout as shown in Figure 1 now contained 22 presses with room for more. See Fig. 2.

As before, the dashed lines represent the approximate floor area needed for one outlined operating press with its auto feed, live boxes, stock, portion aisle space, and the same area represents the approximate floor space needed to store four idle presses.

Presses Number 2, 3, 5 and 13 are being serviced by one operator; presses Number 21 and 23 are balanced out by one operator; and one operator is working a new press in addition to presses Number 6 and 12. Press Number 1 is down for die change, Number 16 has been pulled down for maintenance. Both of these are now in the tool service or preparation area.

Fifty per cent of the presses are being run by four operators and two presses are being serviced. The secondary presses in the storage area are not on the day's schedule. But they can be moved out of storage, plugged in, leveled, and in operation within ten minutes.

If a die change is needed, the presses are pulled out of storage and over to the preparation area. Once the die is checked out by the die setter, in just ten minutes it is in line and ready to work.

Space for New Presses

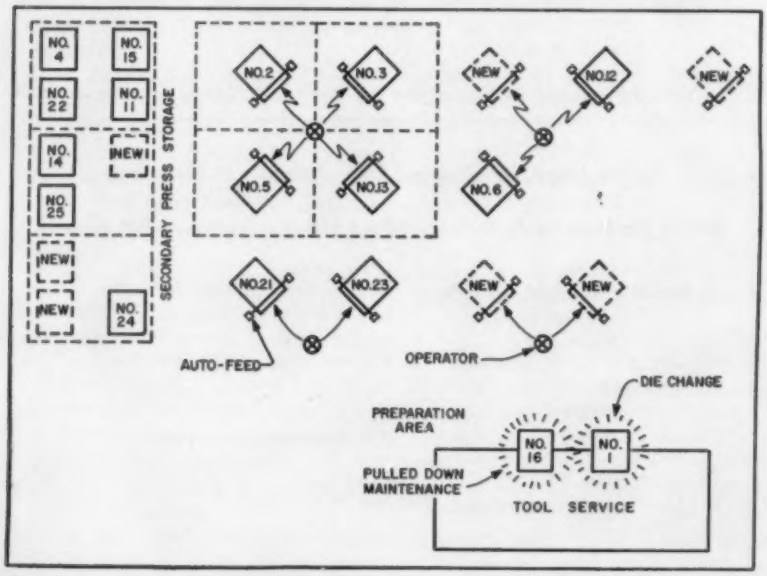
Space savings naturally were a big factor. The new layout took up 72 per cent of the original layout's total square footage and this figure is on the conservative side. Therefore, 28 per cent of the floor area was available for new presses or for cleaning and assembly operations, and there was no sacrifice in adequate aisle and storage space.

Presenting their dollar figures would be of little interest, but you can calculate your own. Use your press room floor area. Take roughly 30 per cent of it and multiply by your operating cost per square foot. If this figure in your company is unavailable, a typical operating cost per square foot in New England is $1.25. This dollar figure is a reasonably accurate "ball park" guesstimate for a standard building: cinder block, steel roof, exposed beams, 8 in. concrete slab, 12 ft ceiling. This is much more reasonable than new plant expansion which would run $4.50 a square foot conservatively for a like floor area.

With ample space available now, this company's press room operations are limited in the number of presses that can be run at any one

(Continued on page 222)

Fig. 2. When presses are mobile they can quickly be moved in and out of storage or to tool service for maintenance and die changes. Average time: 10 minutes.



A PLANT ENGINEERING READER SURVEY

INDUSTRIAL LIGHTING PRACTICE

HOW DOES YOUR PLANT LIGHTING INSTALLATION AND LIGHTING LEVELS STACK UP WITH THOSE OF THE 240 RESPONDENTS TO LIGHTING SURVEY?

LIGHTING? Is it necessary to say anything more about proper industrial lighting than has already been said repeatedly by engineers, by lighting fixture and lamp manufacturers, by power and light companies, safety authorities, doctors, insurance underwriters? Despite all the educational work that has been done in this area, a series of recent interviews on the present lighting practices of industrial plants disclosed a serious need for additional information.

Since the interviews were limited in number, it was felt that a broader mail survey would either confirm their findings or show that only a few "islands of darkness" exist among the many where modern lighting practices are used to improve the quality and increase the quantity of goods produced, as well as to decrease worker fatigue, industrial accidents, and the cost of producing the amount of light required.

Early in 1959 a questionnaire was mailed to 999 PLANT ENGINEERING readers. The sample selected was geographically representative of the magazine's total circulation, but was directed only to readers in industrial plants. Replies were received from 240 readers for a 24 per cent return. The percentage of replies from each industry group approximated its percentage of the mailing. For example, Chemical and Process Industries accounted for 25.7 per cent of the mailing and 27.5 per cent of the response; Construction, Electrical and Industrial Machinery for 19.5 per cent of the mailing, 19.6 per cent of the response; the Metal Industries for 18 per cent of the mailing, 17.5 per cent of the response.

The survey tabulation established that most respondents were responsible for plant lighting practices but that some (small plants) relied upon outside sources or (in large plants) technically trained subordinates to handle specific details. It shows, for example, that in at least 70 per cent of the 240 respondents' plants, Plant Engineering and Maintenance are responsible for specifying lighting fixtures, lamps and ballasts, yet only 20 per cent of the 144 answers to Question 7 gave a reasonable approximation of the per cent improvement in labor utilization needed to justify increasing plant lighting levels from 30 to 120 footcandles.

THESE ARE THE QUESTIONS—AND THE ANSWERS

Question 1. Do you generally make your own lighting layouts, surveys, and footcandle level calculations?

The questionnaire's simple "Yes" and "No" choices were insufficient for respondents who indicated that they call for outside assistance in some cases. Their replies appear in the table as "Share Function." The percentage of those doing all their own lighting work increases with the size of plants and is greatest in the largest plants. The percentage relying entirely on outside sources is greatest in the smallest plants.

Question 2. If not, who generally does this for you?

The 73 replies giving a "No" or "Share Function" answer to Question 1 were examined for information on the outside sources used. It was found that contractors are used by 33 respondents; architects or consulting engineers by 21; power companies by 21; fixture salesmen by 16; lamp salesmen by 6. While some respondents find a single source sufficient, others turn to more than one, depending upon the problem involved.

Question 3. Do you use outside contractors to maintain your lighting system?

Here, again, the "Yes" or "No" questionnaire choices failed to meet the needs of a few respondents who use outside contractors in some areas, for example, in warehouses or for high obstruction lights, but handle the bulk of lighting maintenance with their own personnel.

A slightly higher percentage of the smallest plants use contractors. However, in most plants, whatever their size, lighting system maintenance is an in-plant function. Of the 234 who answered this question, only 14 said that outside contractors maintained their lighting systems and another 6 shared this function with outside contractors; the remaining 214 respondents did the job themselves.

Principal reasons given by respondents who assign some or all of their lighting system maintenance to outside contractors were: 1. to keep the work force at a minimum and 2. to do the work for less money.

(Continued on next page)

In 97 of the 220 plants which do some or all of this work themselves, light fixtures are cleaned by janitorial help; in 70 plants electricians clean them; in 18 plants this is done by both electricians and janitors or by outside help. Replies from 35 of the 220 plants doing this work themselves failed to say whose task it was.

Lamps are replaced by electricians in 131 of the 220 plants maintaining their own lighting systems, by janitorial help in 38 plants, and by both or either or outside help in 14 plants. Again, 35 respondents did not say what type of plant personnel replaced lamps.

Question 4. Do you have a group lamp replacement program in operation at your plant?

Of the 104 plants with *over* 500 employees from which replies to this question were received, 36 have a group lamp replacement program, 68 do not. Of the 111 respondent plants with under 500 employees, 10 have a program in operation, 101 do not. From these figures it would seem that despite the publicity already given this subject, the benefits to be derived from a group relamping program require continued emphasis.

This impression is tempered somewhat by the views expressed by respondents from non-user plants on the benefits to be obtained from group relamping as compared with random relamping. Where a group relamping program is in operation, respondents' comments are almost universally favorable: they believe it gives better light at lower cost. But a favorable attitude toward group relamping was also displayed in the remarks of many respondents whose plants do not have such a program in operation. For example: "We want to start one"; "Investigating"; "No present program but should have for better lighting, less time on replacement, and check on fixture operations." Such opinions would seem to indicate that the trend toward group relamping will continue.

However, the remarks of some non-user plant respondents—cases in point: "Very few benefits in plant areas"; "No benefits—random relamping more economical"; "As yet we are not completely 'sold' on group relamping"—do show that misconceptions on the economics of group relamping still exist among individuals responsible for industrial lighting practices.

Question 5. How frequently do you wash lighting equipment reflectors in the plant?—in the office?

However unjustified by economics the tendency here, as elsewhere, is to give the office better treatment than the plant. The replies show that desirable methods, periodic washing schedules or schedules based on footcandle depreciation, are used somewhat more frequently in offices than in plants. Moreover, these replies may understate the differences in treatment given plant and office, since the term "periodic intervals" is probably often used loosely and the washing frequency, not stated, may well be greater for offices than for plants.

Plants with 1 to 99 employees attended to this task "when work is slack" in appreciably greater proportion than did the larger plants. Some respondents said their lighting reflectors were washed both at "periodic intervals" and "when work is slack," a reasonable practice for plants with seasonal fluctuations in activity.

Question 6. What per cent of the electrical energy consumed by your plant do you feel is used by the lighting system?

It was recognized that fluctuations in the percentage of electrical energy consumed for lighting was related to the industry involved rather than size of plant—very low for the primary aluminum industry with its high energy requirements for production, much greater for industries requiring a high level of illumination and consuming little power in production. Replies to this question were, therefore, tabulated by industry rather than size of plant.

Of the 177 answering this question, half said that lighting requires less than 10 per cent, half that it requires more than 10 per cent of the total electrical energy consumed by their plants. But in some industries well under half the plants use *less* than 10 per cent for lighting purposes; in other industries, well over half the plants use *more* than 10 per cent.

For example, of the chemical industry plants represented, 72 per cent use less than 10 per cent of electrical energy for lighting, 28 per cent use more. Contrast these figures with 36 per cent from the fabricated metals industries using less and the 64 per cent consuming more than 10 per cent of electrical energy for lighting.

Question 7. What per cent improvement in labor utilization would in your opinion be needed to justify increasing plant lighting levels from 30 footcandles to 120 footcandles?

Considering the broad functional responsibilities of most PLANT ENGINEERING readers (fewer than 5 per cent of the respondents were electrical specialists), it is surprising that so many (144 or 60 per cent) ventured an opinion in answer to this question.

And it should not be too surprising that 47 per cent were not sufficiently familiar with the technical details of illumination to estimate that a 1 per cent improvement in labor utilization would pay for the specified increase in lighting levels. The continuing need for education on the economics of good lighting is pointed up by these replies from personnel who, though not lighting specialists, strongly influence their plants' lighting practices.

Question 8. Does your company own a footcandle meter?

Though a footcandle meter is inexpensive and can be employed by untrained personnel, many plants do not have one. Footcandle meters are owned by a greater proportion of larger than of smaller plants. Comparison of the replies to this question with those given in answer to Question 1 shows that footcandle meters are generally not owned by plants which do not make their own lighting layouts, surveys and footcandle level calculations. A total of 149 plants (65

per cent) owned their own footcandle meter while 80 plants (35 per cent) did not own one. Of those plants owning a meter 58 of them (94 per cent of the 149 plants) were plants with 1000 or more employees.

Question 9. Do you consider footcandle levels to be generally adequate for the tasks performed—in your plant—in your general office areas?

Most respondents believe that lighting levels are adequate in both plant and general office areas, a somewhat greater number holding this to be true for general office areas.

Question 10. What published standards do you use to determine desirable minimum levels of illumination?

Published standards, 45 of them, used by 121 respondents have been grouped into six general categories. They are: Legal, Equipment Manufacturer, Trade Association, Technical Association, IES Handbook, Company Engineering Division, and Miscellaneous. Four of these are self-explanatory. Under the category of Legal were replies like "city electric code" and "labor law standards." "Miscellaneous" standards include the National Safety Council, power companies and electrical contractors.

Publication dates of the standards named were not stated, and it may well be that illumination in some plants is based on antiquated standards. The numerous standards published by lighting equipment manufacturers, trade and technical associations, and company engineering departments, are adaptations, in all likelihood, of those established by the Illuminating Engineering Society. This wide acceptance of many varying standards militates against prompt adoption of currently-approved standards and strikes at the very concept of a standard, which should be a universally-accepted criterion of correct practice.

Standards would be easier to use and more widely used if these organizations gave credit to the Illuminating Engineering Society as the source of standards.

The proportion using published standards tends to increase with plant size as does use of the most authoritative standard, that published by the Illuminating Engineering Society.

While 121 of the respondents stated that some published standard was used, 83 did not reply to the question, 30 said that no standard was used. Six were not in a position to know.

Industrial lighting in these plants is probably installed by seemingly adequate rule-of-thumb methods. However, to achieve maximum economy and efficiency, a more scientific approach to standards is necessary. Rule-of-thumb methods are prone to error in either direction and may result in lighting levels too low for maximum efficiency in production areas or wastefully high in storage or hallway areas. This is another argument for a single, generally-accepted standard.

Question 11. Does your company now provide the minimum footcandle levels suggested by these standards?

Answers to this question were received from 118 of the 121 respondents using published standards. Of these 64 (54 per cent) said "Yes," 30 (26 per cent) said "No," and 24 (20 per cent) said standards were maintained in some areas. The last group's comments indicated that illumination levels in most areas of their plants are up to standard and that further improvements are to be anticipated: "Not now, but will when completely modernized"; "No, except in recent installations." One respondent said that standard illumination levels prevailed in most areas but that in others "we do not agree with standards."

Of the respondents whose plants did not observe, in some or in all areas, the levels prescribed by the standards they used, about 70 per cent had recommended adoption of these standards to management. This testimony to widespread interest in improved lighting practices is reinforced by respondents' citations of management objections to their recommendations. These show cost to be a major factor in retarding change. Nevertheless, standards are being met on new installations and upgrading programs are in process on existing installations. Here, the question again arises: What standards? Will these changes be based on a uniform, valid code or will they reintroduce improper lighting levels?

Question 12. New high-frequency lighting systems promise reduced lighting costs. Have you proposed the installation of this equipment on future jobs?

Despite a good deal of publicity, many respondents, particularly in the smaller size plants, are unfamiliar with high-frequency lighting systems, and, equally significant, a high percentage of respondents in the largest plants need to be convinced that they are economically justified. Publication of additional data comparing lumens produced per watt by conventional and by high-frequency lighting systems might effectively overcome this objection.

Several respondents from dairies and mills had the mistaken impression that high-frequency lighting was unsuited for their operations; other respondents thought it "less dependable."

Question 13. Are you familiar with constant wattage ballasts for mercury lighting systems?

It was found that 80 of the 215 respondents to this question have, and 136 do not have, mercury lighting installations in their plants. Of the 80 having mercury lighting, 43 were unfamiliar with, and 37 were familiar with constant wattage ballasts. Thirty of the 37 in the latter group had some of these ballasts in service. Since mercury lighting systems were generally found in large plants, use of constant wattage ballasts was also concentrated among large plant respondents.

Of the plants having mercury lighting, 82 per cent had indoor installations and 47 per cent had outdoor installations.

Question 14. Approximately what per cent voltage drop do you have on your lighting distribution system (from main switchboard to last outlet?

The questionnaire gave respondents three choices. Results, based on a total of 240 respondents, were as follows: less than one per cent—48; don't know—73; no answer—31. Eighty-eight of the respondents gave

a definite percentage figure, all of them above 1 per cent. Ignoring for the moment the content of the replies, it is noteworthy that the proportion of respondents well enough informed on technical lighting detail to answer this question increases progressively from the small plants to the large, rising from 30 per cent in plants with 1 to 99 employees (8 out of 27) to 79 per cent in the 1000-and-over group (50 of 63).

Since good design of a lighting distribution system would limit voltage drop to less than 1 per cent, it is obvious that many firms are spending far more than they should be to achieve their present lighting levels.

Only a small proportion of respondent plants, largely plants with over 500 employees, are using the more efficient lighting distribution voltages—4 per cent have 277/480 volt and 8 per cent have 120/208 volt distribution systems. The percentage still using single-phase 115 volt systems range downward progressively from 88 per cent in the 1 to 99 employee group to 60 per cent in plants with 1000 or more employees, indicating that outdated and uneconomical lighting practices are still widely prevalent.

Question 15. Do you favor the use of 48-in. or 96-in. fluorescent lamps in plant and office areas?

Preferences expressed were better than two to one in favor of 4-ft lamps for both plant and office areas. However, the picture presented by these replies, which runs contrary to the findings of lamp manufacturers, may reflect what respondents' plants have installed rather than what respondents themselves favor.

Question 16. What do you think of luminous ceiling lighting installations for general office areas?

Expressions of opinion were received from 145 respondents. Of the 33 in plants which had luminous ceilings—a total of 355, 170 sq ft—28 like them, 5 had criticisms. Of the 112 respondent plants that do not have luminous ceilings, favorable opinions were expressed by 76, unfavorable opinions by 36. Cost and difficult maintenance were the most common objections, although respondents also opposed luminous ceilings because they were "acoustically ineffective," require more kilowatts than some other systems," "cast shadows," or were "not practical for old buildings with varied ceiling heights." These criticisms reveal a need for additional information on the subject.

Question 17. Who is primarily responsible for specifying the lighting equipment used in your plant?

Analysis of the answers to many of the preceding questions revealed a number of blind spots among respondents when it came to their seeing how lighting practices in their plants fitted into the whole cost of operation. The questions then arise: Who should be sold on the advantages gained by acceptance of modern lighting concepts? Who should be educated in lighting economics? Who, logically, other than the individual responsible for specifying the equipment to be used?

Respondents' answers show that plant engineering and maintenance personnel have the primary responsibility for specifying fixtures in 76 per cent of all plants represented, for specifying lamps in 74 per cent of all plants, and for specifying ballasts in 84 per cent. General management specifies fixtures in 15 per cent of all plants, lamps in 11 per cent, and ballasts in 8 per cent. General management is responsible for specifying lighting equipment in many of the smaller plants, its role decreasing progressively and that of plant engineering and maintenance increasing as plant size increases.

Question 18. Have you developed plans to install lighting equipment in the next 18 months?

Among plants with fewer than 500 employees 18 per cent made such plans, whereas such installations were planned by 56 per cent of the plants with 500 or more employees.

For plant areas, plans had been made to install some 426,000 sq ft of filament lighting in a total of 20 plants, more than 1,850,000 sq ft of fluorescent lighting in 38 plants, and about 95,000 sq ft of mercury lighting in 10 plants.

Well over half (1,180,000 sq ft) of the fluorescent installations were planned at 35 or 40 footcandles—considerably below present recommended levels for work areas. Of the remaining fluorescent lighting, 133,000 sq ft will be installed at footcandle levels ranging from 10 to 30; 178,000 at from 45 to 120 footcandles. With the exception of one 24,000 sq ft installation, all mercury lighting planned will go into plants with 500 or more employees at levels from 3 to 80 footcandles.

A total of about 400,000 sq ft of fluorescent lighting was to be installed in the office area of 26 respondents' plants, of which only 95,000 sq ft would meet the minimum 100 footcandle level recommended for general office areas. Filament office lighting installations were planned by six respondents' plants, one a 150,000 sq ft, 40 footcandle installation; the remaining five will be small installations, totaling a bit over 4000 sq ft in all.

Question 19. Are you familiar with or planning to use any of the new high wattage fluorescent lamps?

High wattage fluorescent lamps are known to 89 (37 per cent) of the 240 questionnaire respondents; 26 (11 per cent) plan to use them; 3 (1 per cent) are using them; 96 (40 per cent) are unfamiliar with these lamps; and 26 (11 per cent) failed to answer the question.

Question 20. About how much do lamps of all types cost your company yearly?

Lamp costs vary from $100 per year in each of three small plants to more than $80,000 in each of two large plants. A total of $538,400, an average of $5550 and a median of $2000 was spent annually by the 97 plants furnishing lamp cost information. Forty-one respondents either said they did not know what their lamps cost or indicated that the information was not readily available. Failure of 102 respondents to answer the question probably reflects a widespread reluctance to disclose actual cost figures. **End**

TANKLESS PUMP SYSTEM—

Plant gets extra supply of cold water and at low cost

Large quantities of cold water are required for butt welding the chain, above.

ANY PLANT THAT processes steel through forming, automatic welding, case hardening and plating operations is bound to require large quantities of cold water. At the Peerless Chain Company of Winona, Minn., the plant supervisor found it advisable to take a second look at the water supply situation.

What prompted this study was the knowledge that nearby wells were going down 150 ft and producing quality water at about 58 F. If a similar well could be sunk, the cost of using 9000 to 12,000 gallons every hour could be reduced significantly.

The major problem was one of delivering it under steady pressure when there was absolutely no room for a new elevated tank. The plant, located along a bank of the Mississippi River, has been extended right up to the property lines. No adjacent property was available. The roof was not built to support an elevated tank and the cost of shoring it up would have destroyed any economy of using the well.

Inside the building, all available space was occupied by various plant operations. If there were any more room, it would be quickly filled with more machinery. As it is, the plant operates a 24 hour day, seven day week during the busy fall season. An unexpected blizzard somewhere in the United States can suddenly build up an enormous dealer demand for tire and towing chains.

The solution turned out to be a tankless system for the water supply. In the past, the tankless system has been used mainly by large cities where booster pumps supplying the pressure could be attended by trained personnel. Now, low-cost automatic controls can handle the job at any location.

Compact Control Unit

A compact cabinet, containing controls, motor starters and circuit breakers was custom-built for the job by the Automatic Control Company, St. Paul. Beside it, in a small room in the basement, are a liquid chlorinator, four pumps and a tank. The system is called "tankless" because the tank does not supply any pressure on the lines. Its primary purpose is to provide suction protection for the booster pumps and allow longer on or off intervals for the deep-well pump.

When the demand for water is low during the early morning hours a single pump supplies about 300 gpm, continuously. An increase in demand drops the pressure slightly and throws a pressure switch that brings in another booster pump. If these two cannot handle the job, a third pump automatically adds its capacity. Any drop in demand will turn off the pumps in a reverse sequence.

Surges in pressure are balanced out through automatic delays in pump starting and in the characteristics of the pumps themselves. Booster pumps are controlled by pressure switches connected to the distribution lines but the deep-well pump is independently controlled by

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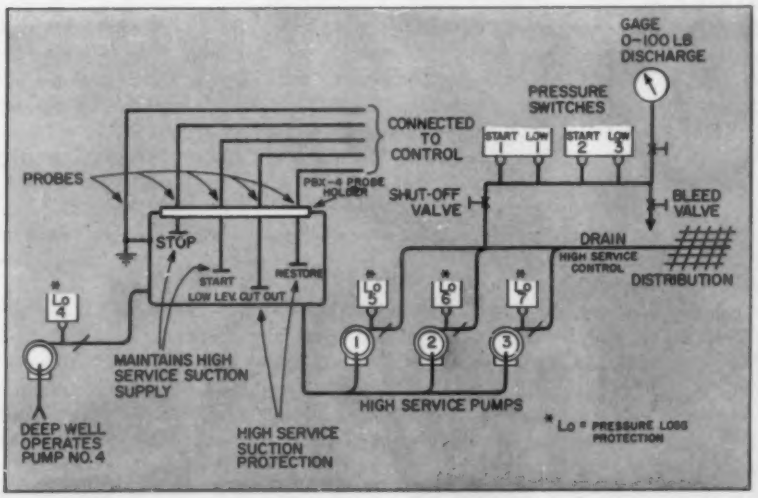


Hydraulic layout shows how the various components were tied together to provide a tankless pump system for supplying plant's need for cold well water.

These booster pumps supply water under pressure directly to the lines.

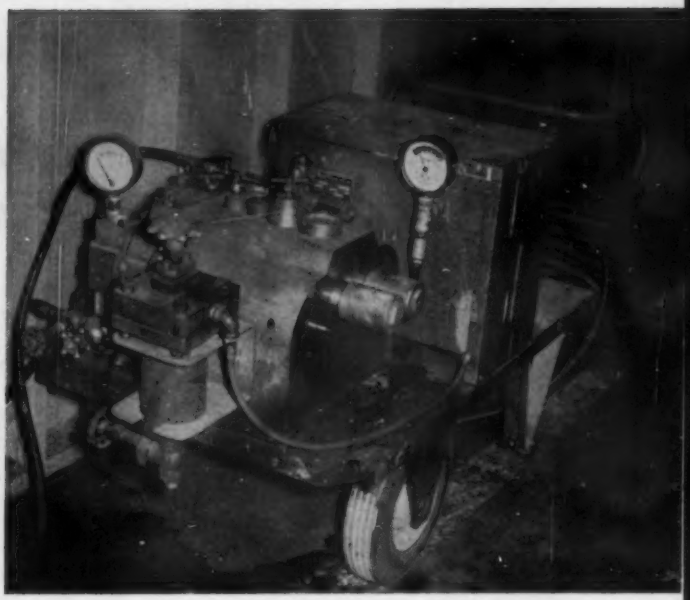


Fig. 1. Air-actuated piston pump and heater are outside air conditioned bonding room. Spray gun is connected to the pump by high pressure hoses through wall.

Airless Spray Applies Adhesives

A PLANT ENGINEERING idea, and a single piece of "already on hand" plant engineering equipment recently saved the cost of installing a $20,000 paint booth at the Long Beach Division of Douglas Aircraft Company.

This Douglas plant has been engaged in the production of metal bonded subassemblies for approximately five years. At first, and until quite recently, the adhesive used in bonding was hand-brushed on the parts to be bonded in an air conditioned and humidity controlled room. But when the DC-8 jet airliner program swung into full production, the demand for bonded subassemblies increased until the relatively slow technique of hand-brushing the adhesive became an overburdening chore.

A rolling technique was found to be still too slow and, while a spray gun accomplished a good and fast application job, the overspray and bounced spray, impelled as it was by the compressed air stream from the spray gun, soon fouled the surrounding area with the highly volatile adhesive fumes. It was quickly evident that if a conventional spray application were to be used, a properly vented spray booth in which to accomplish the job would have to be constructed. Preliminary estimates set the cost of a booth at $20,000.

It was then that the idea for using an airless spray gun to apply the adhesive entered the picture. It was already known that overspray and bounced spray from an airless spray gun was quite harmless because there was no air stream to carry it outward and mix it with the surrounding atmosphere. In this type of equipment, the spray is projected by internal fluid pressure only, and the spray particles soon lose their velocity and settle harmlessly after they leave the gun nozzle unless they impinge against the surface being sprayed.

Nordson-Bede airless spray equipment, already being used by the plant maintenance department, was selected for the tryout. The pump and heater, mounted on a tow cart, was set up just outside the air conditioned and humidity controlled metal bonding room. The spray gun was connected to the pump through the bonding room wall using metal-encased high pressure hoses.

The Bede airless spray unit utilizes an air-operated piston pump which actuates a two-cylinder pump to accumulate the necessary spray pressure. The heating unit heats the material being sprayed after it has been pressurized. The pump, the heating unit, and the spray gun itself are connected in a continuous loop (with twin pressure hoses leading to the spray gun), and continuous circulation is maintained through this loop. This prevents cooling of the spray material which, minus continuous circulation, would have opportunities to stagnate in the lines.

A number of tests were run to establish the optimum spraying pressure and amount of heat to use. Currently the bonding adhesive is being sprayed at 600 psi nozzle pressure, and at 100 F, although investigations are still in progress which may alter these figures slightly.

The parts being prepared for bonding are sprayed on an open bench in the bonding room wherein the environment is closely controlled at 72 F and 40 per cent humidity. The airless spray does not cause any more air contamination than the previously used hand-brushing technique. Air fouling caused by the normally high volatility of the bonding adhesive is effectively handled by the room's air conditioning system.

With the airless spray gun, there is no backwash of air which can flood the operator with fumes and overspray.

The adhesive supply for the Bede pump is kept in a conventional 5 gal paint can inside the bonding room from which it is withdrawn by siphon action as needed. All hoses leading to the unit are of the quick-disconnect variety so that the unit can still be used by the maintenance department during its "off hours" at the metal bonding room.

The airless spray setup now used at Douglas to apply the bonding adhesive is one illustration of where a simple idea paid off in good results. **End**

SIMPLE CODE SYSTEM ELIMINATES CIRCUIT TRACING

By HENRY WOOD, Plant Engineer, Fluid Packed Pump Co., Los Nietos, Calif.

CAN YOU stand at a machine in your plant and visualize every disconnect, circuit panel, feeder and main circuit breaker feeding current to that machine?

Here is a simple code system that we use to supply this information. The system consists essentially of assigning letters to main circuit breakers at the substation and then using combinations of these letters and numbers to indicate subsequent disconnects in each circuit.

For example, we have five circuit breakers in our main substation panel and these are marked with the letters A, B, C, D, and E. Where a disconnect receives power directly through a main breaker, only one additional identifying number is required. Thus, disconnects directly related to the main breaker A are designated as A-1, A-2 and so forth. Disconnects that receive power via A-1 are identified as A-1-1, A-1-2 and continuing on until all switches have been identified.

Additional numbers can be used to indicate further relationships in a logical and orderly manner.

This is particularly important from the plant engineering viewpoint since it means that data regarding current loading of available plant circuits can be quickly obtained for comparison with circuit design data. This is frequently required when it is necessary to determine the best source of power for new electrical equipment or relocating old.

Our maintenance electrician corrects appropriate circuit layouts and schematic drawings each time new disconnects are added to plant power panels. With this system we are able to obtain plant load information that is always up to date. The layout and schematic drawings are redrawn whenever corrections become numerous enough to jeopardize their reference value.

To physically identify individual switches, glue is used to apply plastic letters and numerals to panel surfaces. At the top of each panel a letter and/or numeral is placed to designate the switch through which the panel receives power. Adjacent to each disconnect, a single number is placed to identify the switch in the panel.

In addition, each machine throughout the plant has a small aluminum plate which bears the letter and number or numbers of the switch supplying power to the machine. This makes it a simple matter for the operator, maintenance man or foreman to turn the power on or off whenever there is a need to do so.

Let's look at a typical example. Here is a lathe with D7-8 marked on the control box. Without looking any further I can tell you that this lathe is connected to switch number 8 in power panel D7. This panel in turn is fed from switch number 7 in sub-panel D which in turn is fed from the main circuit breaker D in the substation. **End**

Five 600-amp feeder breakers in main substation power panel are identified by the first five letters of the alphabet.

Plant electrician, Jim Hnizdil, points to circuit D-10-6 showing how numbers are used to identify individual switches.

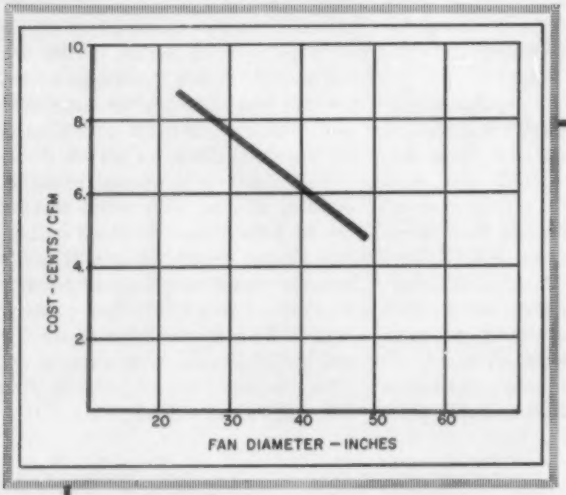
time saver series
CONSTRUCTION COST ESTIMATING PART 8

VENTILATION, AIR CONDITIONING

VENTILATION

Of primary consideration in the ventilation costs of a building are the fans. As a general rule the larger the fan installed, the less the cost per cubic foot of air exhausted; partial explanation of this rule is the fact that the expense of raising a small fan and setting it in the roof is practically the same as the installation costs for a large fan.

Installed costs of fans from 24 to 48 in. in diameter are plotted in following chart. Cost is in cents per cfm, as shown in three previous examples. Values are approximate, since variables such as purlin spacing will affect installation costs.



Typical costs for fans, on a "per cfm" basis:

1. Building volume, 1,912,500 cu ft; 9½ minutes per air change. Required air flow, 201,600 cfm. Use seven fans and stacks, each 48 in. in diameter; 2-blade fans, 3 hp will move 28,800 cfm each.

Cost $8250, or $0.0487 per cfm.

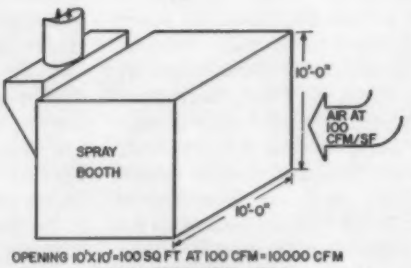
2. Building volume, 559, 400 cu ft; 20 minutes per air change. Required air flow, 28,000 cfm.

Use four fans and stacks, each 27 in. in diameter; 4-blade fans, ½ hp will move 7000 cfm each.

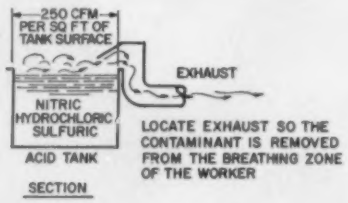
Cost, $2290, or $0.0818 per cfm.

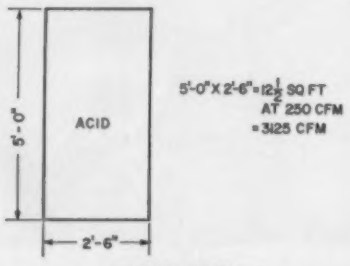
3. Building volume 6,300,000 cu ft; 60 minutes per air change. Required air flow, 105,000 cfm. Use 12 fans, and stacks, each 32 in. in diameter; 6-blade fans, ¾ hp will move 9000 cfm each.

Cost, $7722, or $0.0735 per cfm.

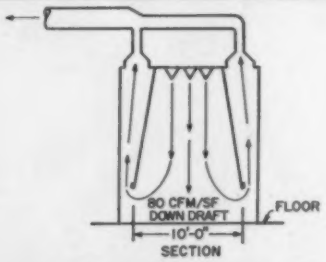


SPRAY BOOTH VENTILATION

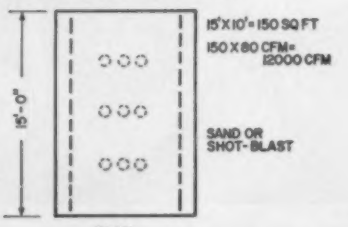

250 CFM PER SQ FT OF TANK SURFACE
EXHAUST
NITRIC HYDROCHLORIC SULFURIC
ACID TANK
LOCATE EXHAUST SO THE CONTAMINANT IS REMOVED FROM THE BREATHING ZONE OF THE WORKER
SECTION



VENTING ACID TANKS



SHOT OR SAND BLAST VENTILATION



Ventilation Ductwork

The price of installed duct work depends a great deal upon working conditions—primarily, on how much clearance is available around the work. For average conditions of work activity, the following prices can be used:

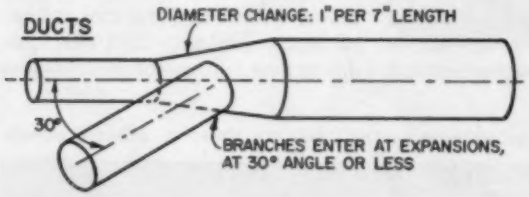
ROUND DUCTS

Diameter	Gage	Installed Cost
1-13 in.	24	$1.00 per lb
13-18 in.	22	.80
18 in. and over	20	.75

RECTANGULAR DUCTS

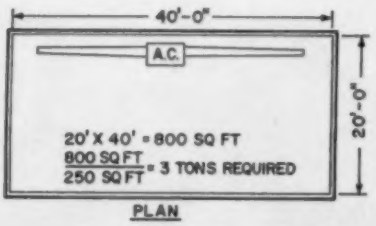
Diameter	Gage	Installed Cost
6 x 12 in.	26	$1.00 per lb
8 x 12 in.	24	1.00
10 x 12 in.	24	.80
Larger	22	.80

Elbows, 45 or 90 deg:	$2.50 per lb, installed
Other angles:	3.00 per lb, installed
Grilles, no shutters:	1.50 per sq ft
Register:	2.50 per sq ft



AIR CONDITIONING

General office area—average conditions. No specific humidity requirements, no extraordinary heat gains. Cost includes unit, controls, ducts, water lines, and outside fresh air intake.



One ton of refrigeration handles 250 to 300 sq ft of floor area; office in this example 800 sq ft, therefore requires 800 / 250 = 3 tons of refrigeration.

One ton of refrigeration = 400 cfm; 12000 Btu

Costs:

One ton of refrigeration costs $600, for conditions in this example. With no ducts required, cost would be $500 per ton; with ductwork into individual offices, cost would be $700 per ton.

Insulation of Air Conditioning Ducts

Supply ducts. Use 1-in. thick fiberglass rigid duct insulation with vapor seal; cost, $0.16 per sq ft. Pins (cost, $.01) welded to the ducts ($.01 to apply) impale insulation, which is secured with speed washers. Hangers can be used (cost, $.04), cemented to ducts with adhesive (cost $.015). All edges and joints of the insulation are taped. Stiffener angles in the duct should be covered with blanket foil insulation.

Cost of supply duct insulation:	$0.60 per sq ft (straight runs 0.70 per sq ft (straight runs with elbows and cleanouts)

Return Ducts. Should be insulated if they go through areas of high heat. Use fiberglass blanket, density 1½-lb, with aluminum foil on one side.

Cost of material:	$0.12 per sq ft; installed, $0.27 per sq ft

Fresh Air Intake. These ducts should be insulated to prevent condensation in cold weather. Use two inches of cork, secured by pins. After cork is applied, cover with two coats of asphalt mastic. Limiting temperature for cork, 125 F.

Cost of cork:	$0.38 per sq ft
Cost of mastic:	0.15 per sq ft (2 coats)
Total, installed:	$1.00 per sq ft

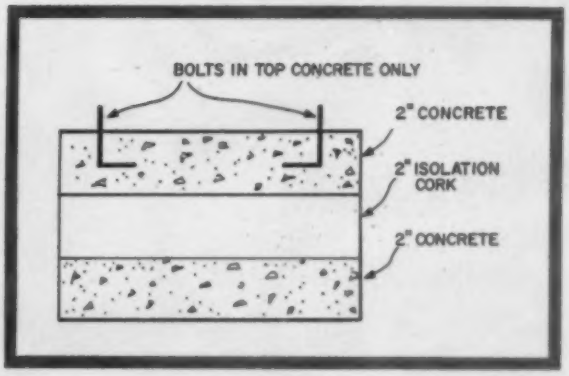
Sound Insulation. It is sometimes necessary to insulate the inside of the supply duct to reduce airborne sound or turbulent air noises. To do this, the duct can be lined for a distance of 15 ft beyond the compressor with 1½-lb density fiber glass duct liner.

Cost of material and adhesive:	$0.15 per sq ft
Cost, installed:	0.30 per sq ft

Insulation Against Sound Transmission

To prevent transmission of compressor noise through the building structure, the compressor can be set on isolation pads. One method uses cork as shown in the diagram. To install, pour the bottom concrete slab; before it sets, place cork, then pour topping concrete. This procedure will bond the cork securely to concrete. Cork thickness depends on the weight of the compressor involved.

Cork costs:	2-in. pad, $1.60 per sq ft 1-in. pad, $0.86 per sq ft



AIR-PROPELLED CARTON PARTS
Items Go by Duct to Proper Bins

By J. E. MAREK, The Chicago Screw Company, Div. of Standard Screw Co., Bellwood, Ill.

REGARDING packaging as a very vital and integral part of the over-all operations, the three fastener divisions of Standard Screw Company became engaged in an over-all marketing program which necessitated the use of standard size cartons.

From the basic research work to make this program workable, it became apparent that storage of the made-up carton items was inadequate. It allowed damage and did not allow enough lead time between manufacture of containers and usage, thus slowing up the packaging lines.

Engineers at each of our three plants were called on to develop and lay out the areas to be used for the storage of carton parts and the proper material to be used for the bins, ductwork, and also the blower system.

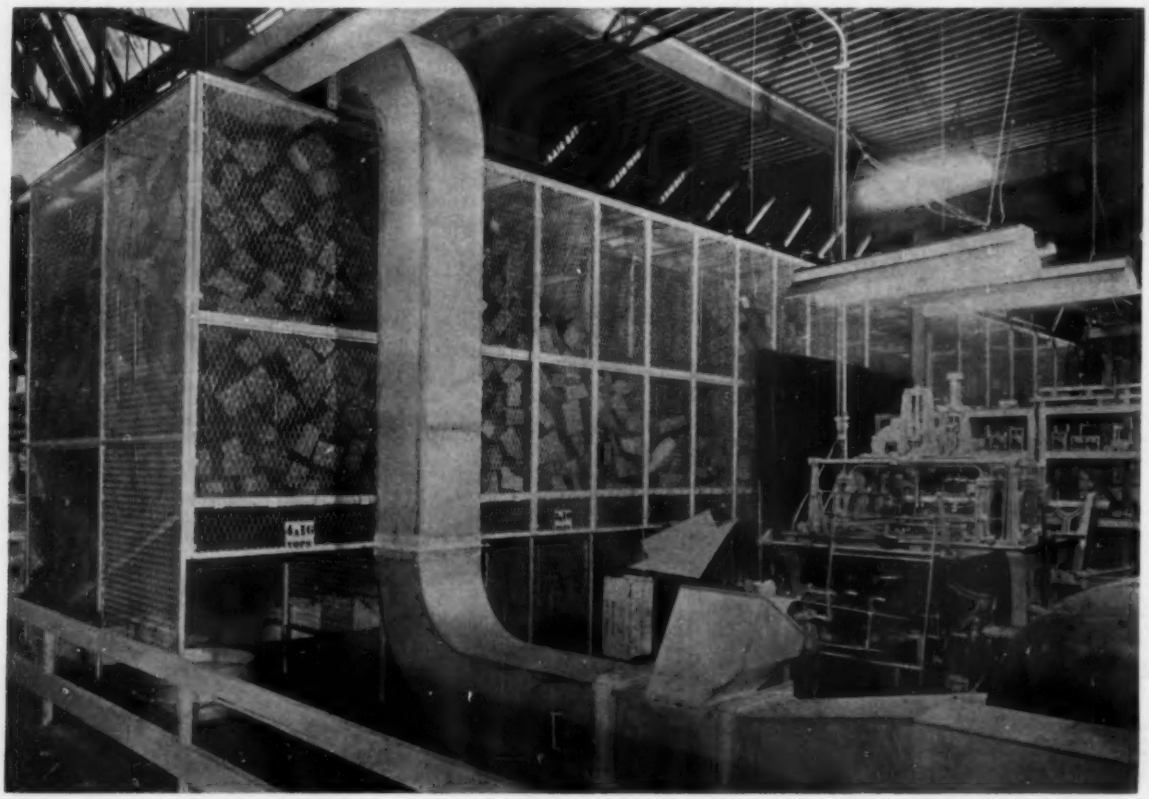
The material for the bins had to be compatible with the intensive safety program which the company follows. By this is meant that the material had to be strong enough to contain the carton supplies and to support the necessary ductwork. Yet, it had to have no sharp edges which could tear clothing or injure employees.

Expanded metal was finally decided upon with diamond-shaped openings measuring 1 in. across corners. This dimension was selected since the corners of the boxes would protrude slightly, helping to support part of the weight and preventing boxes at the bottom from being crushed.

An installation 90 ft long, 12 ft high, and 9 ft wide consisting of 32 separate bins resulted. Although 16 sizes of cartons are used, separate bins must be used for covers and boxes. The duct for the pneumatic transfer is secured to the tops of the bins, running along the center.

To supply the air stream necessary to move the carton items into the bins, we use a squirrel-cage blower delivering 7900 cfm at 2½-in. static pressure at 1400 rpm, driven by a 5-hp motor. A 4500-fpm

Fig. 1. Container parts travel from the machine by conveyor to an opening (arrow) and are blown to selected outlets.



conveying velocity is necessary for small boxes, 4000 for large. The items are fed by means of a belt conveyor from the gluing machine into the air stream. The range of box sizes handled at a rate varying from 48 to 60 per min.

At the present time the proper bin is selected for storage by manual operation. A long-handled pin is provided which fits into the bin door operating lever making it possible to open and close the desired duct gate. This pin is left in position to indicate which particular compartment is ready. However, with ever increasing business, we plan ultimately to make the switching operation automatic using solenoids and a control board located at the side of the box-gluing machine to actuate the solenoids.

A cost reduction of about 50 per cent has become apparent with this installation. In addition to this we must consider that the recently completed project will fit into our long range planning picture in that we are in the process of developing automatic packaging for our various products. **End**

Fig. 2. Box items drop by gravity to the opening of the marked storage bins.

TANK TRAILER HEATED ELECTRICALLY

STORING, transporting and heating a special asphaltic-base coating posed three separate problems for the Empire State Culvert Company. This firm is engaged in forming highway culverts from corrugated metal stock to which an asphalt coating is applied. Lack of space for tank storage prevented the company from taking full advantage of the economics of handling asphalt in its fluid state.

Use of a heated trailer tank resulted. The special tubular heaters for the 4500-gallon tank were designed and produced by the Hynes Electric Heating Company, working in conjunction with the tank manufacturer.

Two of the heating elements have immersed lengths of 30½ ft and two more have lengths of 16½ ft. The four elements have a total capacity of 45 kw. The shorter heater tubes in the bottom of the trailer tank are arranged to heat relatively small volumes of asphalt. This occurs when the fluid level falls below the longer heater tubes. The short tubes are also used for maintenance purposes.

Asphalt is loaded at the refinery into the trailer tank at anywhere from 350 to 450 F. The heater capacity is available to bring the contents up to desired operating temperature at the culvert plant. Power is supplied to the trailer through simple plug-type connectors. A thermostatic control keeps the contents at operating temperature.

The heater tubes can be entirely removed in order to clean the interior when necessary. This is done simply by unbolting a flange connection and withdrawing the heater tube. The heating elements can also be removed from their tubes without draining the tank or disturbing the insulation. **End**

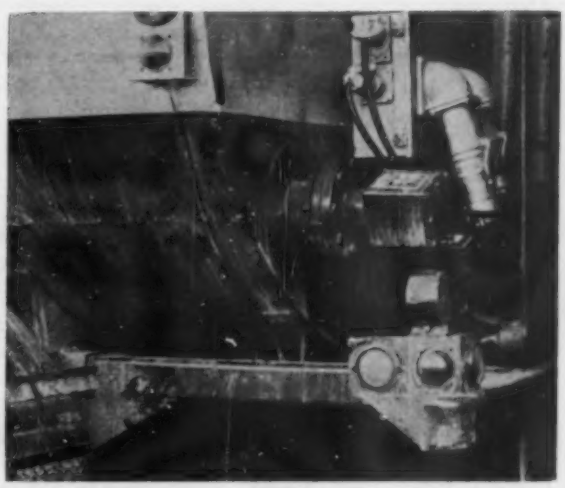


Fig. 1. Trailer gets power from plant through plug-in setup.

ALARM INSTRUMENTATION

How Devices and Systems Can Be Watchdogs of Variables

By CHESTER S. BEARD, Chief Engineer, Valve and Actuator Div., General Controls Co., Glendale, California

MOST important phase of the instrumentation of a plant is the design of the emergency shutoff and alarm system. A few general principles will contribute to the success of the system.

1. Make the system as simple as possible—at least as simple as the measurement and control instrumentation.

2. Use a second instrument for sensing an unsafe condition. Preferably this instrument for sensing would be dissimilar in operation.

3. Select shutoff valves and equipment that will fail safely with loss of operating medium.

4. Install emergency instruments so that they can be tested by simulating an unsafe operating condition.

5. Make visual or audible indications of unsafe conditions readily identifiable from other sights and sounds.

6. Indicate approach to an unsafe condition to the operator in preference to shutting down equipment unless resumption of production is not too difficult. Additional protection against a sleeping operator may be necessary.

Four phases of design of emergency alarm and shutdown instrumentation present themselves for discussion. These are: 1. energizing medium; 2. method of notification of unsafe condition; 3. sensing elements, and 4. shut-off equipment.

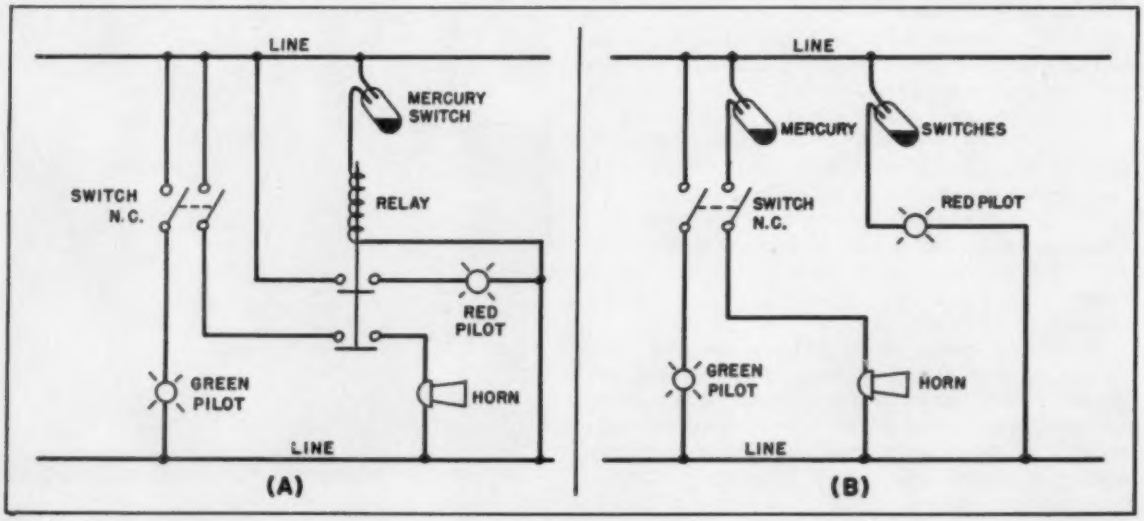
Energizing Mediums

Energizing mediums available for operating alarm systems are mechanical, electrical, hydraulic and pneumatic. All mediums are used; although the purely mechanical is not as prevalent. The lifting of a telltale by the rise of a float in a tank, the rise of the lifts of a gas holder or the governor of an engine are examples.

Electrical alarm systems are the simplest to design; mainly because it is not difficult to cause movement of a contactor using the change in almost any variable which must be sensed. Pneumatic or hydraulic energization of an alarm is infrequent except when air is furnished to a horn or whistle upon activation of an emergency sensing device.

Use of all four forms of energy is more general for operation of an emergency shutdown actuator. Pneumatically loaded diaphragm actuators are used to operate emer-

Fig. 1. In system "A" red light goes on and horn is sounded in an emergency condition; pulling switch stops horn, puts out green light but leaves red one on. Sequence in system "B" would be the same even though the setup is different.



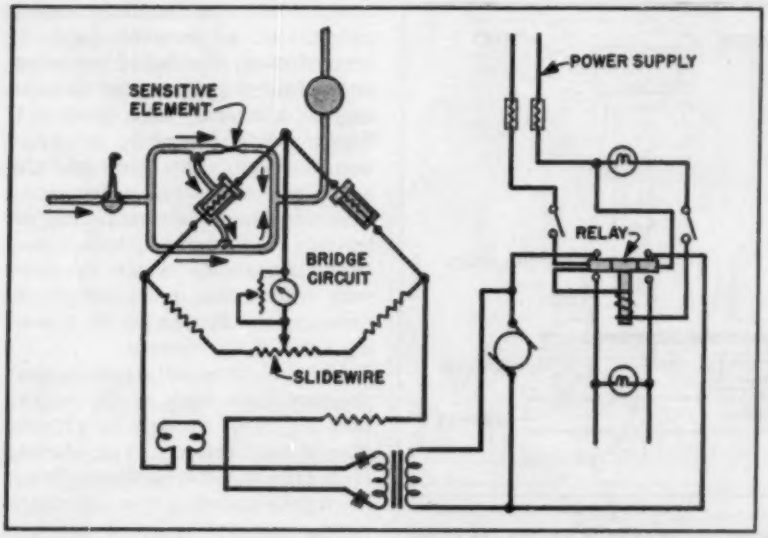


Fig. 2. Variation in the thermal conductivity in the sensitive element such as is illustrated near upper left corner will operate an alarm or control system.

gency equipment such as valves, disconnect linkages or brakes. Pneumatic or hydraulic pistons may accomplish the same actions. Applications of electrical activation to cause fail-safe position of emergency shutdown equipment are boundless.

Reliability of the energizing medium is paramount. Pneumatic sources for systems or individual pieces of equipment may be backed up by buried storage tanks. A check valve is installed in the inlet to the storage so that the pressure in reserve is always equal to the maximum reached at any time in the pressure supply lines. Use of a separate set of wiring for the emergency system will guard against inadvertent losses of power due to overload on the operating circuit. Further insurance for continued operation is obtained by use of a d-c source from storage batteries or a secondary engine-driven a-c source.

Notification Methods

Use of visual and audible evidence of an abnormal condition is most common. An emergency condition in an isolated piece of equipment may be successfully identified by a horn. Various tones or types of horns should be used for easy identification of the equipment.

Attention is called to a multiple installation of alarm identification by a horn. Individual identification is by a light or annunciator drop. The location of the actuating instrument is registered on the tab or light box.

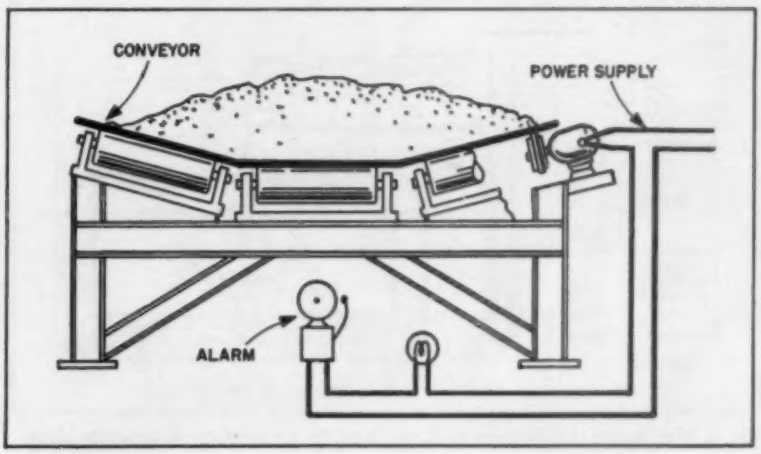
A lighted bulb for normal operation has the advantage of alerting the operator if the light burns out. Use of the circuit in either Figure 1A or 1B will allow the operator to locate the energized circuit even though the alarm light does not come on. In Figure 1A, the alarm circuit operates a relay which closes the circuit through the red light and a horn. The horn and the green light are de-energized by a switch. Thus the red light on, and green light off, shows an emergency condition. Upon clearing the trouble, the relay drops out and the switch is closed to bring on the green light.

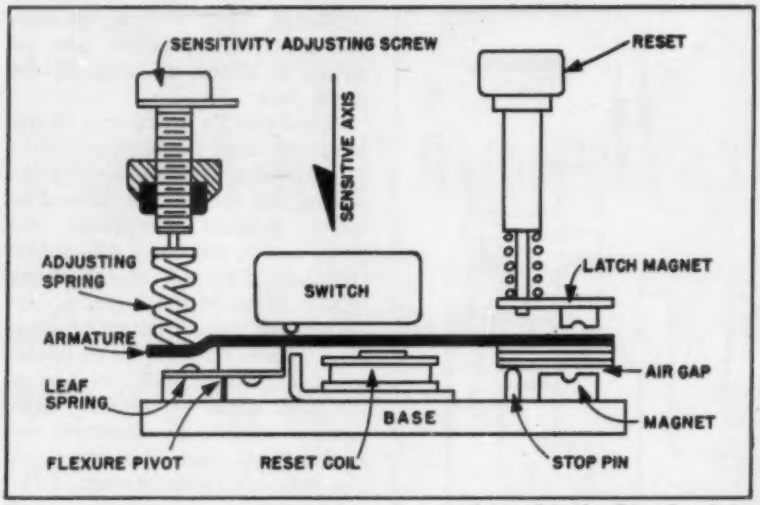
A comparable action may be obtained by using two contacts in the alarm sensing instrument. It is important that the selected method be made standard throughout the plant so that personnel will not be confused. Location of the alarm boards at an exposed spot is important for rapid spotting of trouble. Speedy response by an operator may often forestall operation of automatic shutdown which, in most cases, is caused by continued deviation from normal in excess of that indicated by the settings.

The same variables that we strive to control with an instrument are the ones that become hazardous by exceeding a maximum or dropping below a minimum. We are therefore, dealing with the following variables when we select equipment for alarms: 1. pressure that is excessive or inadequate; 2. loss of level or overflow; 3. temperature that is excessive or too low; 4. flow rates beyond desired limits; 5. electrical circuit characteristics; 6. chemical or physical change beyond process limits; 7. movement of machinery within speed limits; and, in this era of nuclear energy, 8. excess radiation. It is a cardinal rule that the alarm function requires an additional instrument, preferably dissimilar to the controller or recorder.

Pressure • All accepted methods for indicating pressure may be used in alarms or shutdown devices. A

Fig. 3. This example shows how a centrifugal electric switch can be used with a belt conveyor. The alarm can be energized to show high or low rate of travel.





Courtesy Robertshaw-Fulton Controls Co.

Fig. 4. The armature is released by an excessive vibration to operate the switch.

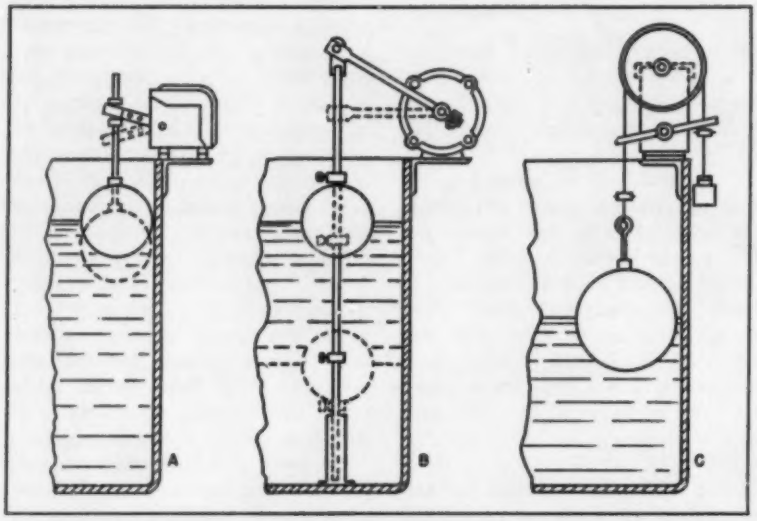


Fig. 5. Float switches may be made to operate over wide ranges of fluid levels. Flexibility is obtained, of course, by adjusting the stops and the switch trips.

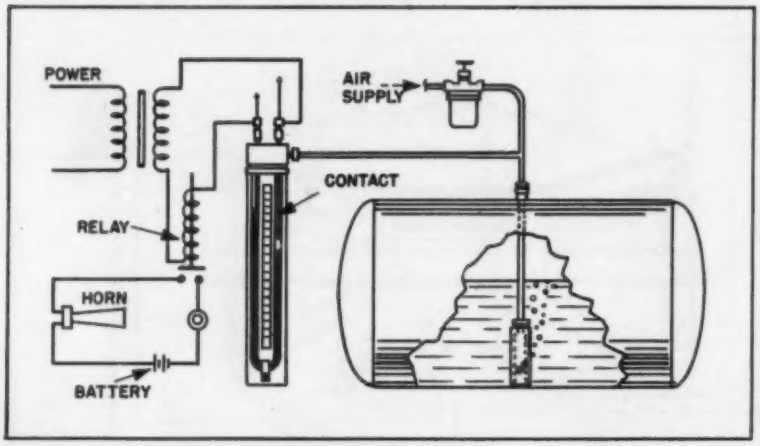


Fig. 6. Mercury in the manometer is displaced by air pressure to cause an alarm.

bourdon tube, the familiar actuating element of a pressure gage, is very effective. Instead of operating an indicating pointer, the element may tilt a mercury tube, position a flapper-nozzle assembly, or position a switch. Low pressures are evaluated using a manometer, limp diaphragm, inverted bell, or bellows. Differential pressure instruments may be sensed by pressure instruments in which static pressure may be exerted on opposing sides of the element.

Voltage output of extremely low pressure gages such as the ionization, Pirani or vacuum tube types may be amplified to operate alarms. High pressures may require a spring or weight-loaded piston or strain gages.

Temperature • Temperature is the most difficult problem in process control. It is also the most difficult to protect in an alarm system. Precautions against improper installation of thermal elements for control are just as important in an alarm system. Inherent lags through thermometer wells and incorrect readings due to improper location are factors that nullify efficient protection of equipment. All types of temperature systems such as bimetallic strips, potentiometric, filled thermal systems (Fig. 2) and even mercury thermometers, may be employed.

Flow • Evidence of flow below a minimum is the most prevalent requirement. Applications include: flow of cooling water to engine jackets; flow for ventilating vaults and shafts, cooling oil supply to transformers, and air flow to soaking or annealing furnaces. Area or differential meters may operate alarms while a swing check may carry a contactor switch to close a low flow position. Displacement meters do not adapt themselves to alarms because they do not indicate rate of flow.

Electrical Circuits • Depressed voltage may be detrimental to a process or may cause variations in speed or operation of equipment. Low voltage may be sensed by a voltmeter with a contactor or by a relay which releases under calibrated spring tension.

Physical or Chemical Change • Changes in pH, conductivity, color, density, or any characteristic which

would cause an off-standard or dangerous product must be sensed with instruments similar to those which are used for quantitative recording. They may be simplified due to the limiting of calibration to one point. In many cases, qualitative determination is acceptable as in many applications where evidence of toxic gases must activate an alarm. Many excellent instruments are available to determine excess or deficiency of a variety of gases. See Fig. 2.

Movement of Machinery • Continued movement of conveyors (Fig. 3), elevators, feeder, blowers, may be sensed by a centrifugal switch similar to a flyball governor which closes contacts at some predetermined speed. Output of a pump may be used to sense rotative speed. Excess vibration may be used on an armature (Fig. 4) to snap from one magnet to the other to operate a Klickswitch.

Level • More ingenious level alarms have been devised than other types of alarms. Common floats (Fig. 5) electric eyes, gamma rays, differential pressure variations (Fig. 6) between gaseous and liquid states have all been employed. Level of solids may be sensed (Fig. 7) by sensing resistance to the rotation of a paddle.

Combustion • Safe conditions for combustion of fuel in a boiler or heater are sensed by pressure differential or flue gas analysis switches. These switches are able to activate emergency valves upon high or low fuel pressure, differential across forced or induced draft fans, firebox pressure, or any single condition or combination of conditions which will cause unsafe firing. Other safeguards sense the existence of flame. These may be either photo-electric to detect infrared radiations, flame resistance, or conductivity changes (Fig. 8) or flame rectification systems.

The detection may be on the main burner for modulating controlled firing or on the pilot burner of on-off systems. The simplest system requires manual reset of the electric fuel valve after re-energizing the flame-failure system using an auxiliary torch. More elaborate systems will automatically check out all conditions and set up a purge period before relighting. Relighting may also be automatic using electric ignition which occurs when all conditions are correct for lighting off.

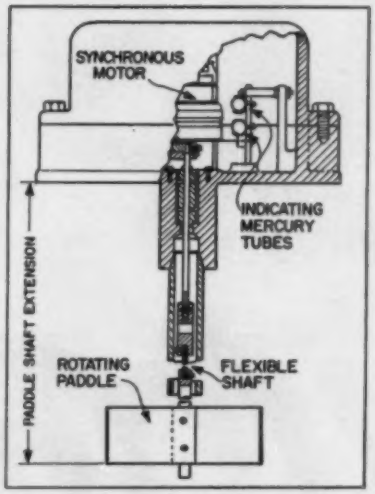


Fig. 7. System for indication of level.

Transducers • Use of transducers as primary elements has many advantages. Element is located close to variable being measured; response is fast; inflammable liquids are not piped into control room; output is compatible with data reduction systems; and wiring to remote emergency control center is simple and economical.

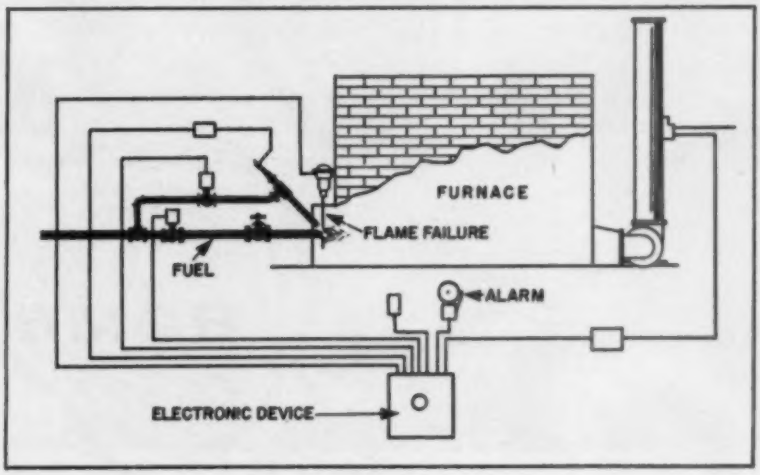
Examples of transducers may be a strain gage for pressure, a permanent magnet vibrating relative to a coil for vibration, or a resistance thermal element for temperature. The small electrical output in any of these elements is amplified and used for operating a relay to operate a shutdown or alarm. Set point may be adjusted very accurately by calibration for the set point rather than over a scale covering the entire range.

Success of even the most carefully engineered emergency shutdown and alarm system depends upon the inspection and testing program. Correct testing requires simulating the actual operating condition to cause the alarm to operate instead of merely manually operating contacts.

Periodic testing requires a well engineered manual consisting of a page for each emergency instrument. A schematic diagram must show the primary sensing element and the wiring to the annunciator board or means of causing the shutdown. The location of each sensing element is stated as well as the piping and instrument diagram number showing the installation. It is wise to develop a separate P and ID (piping and instrument diagram) for emergency instruments. The instruction page must show a step-by-step method of testing, set point limits, and calibration method.

Operation of alarm equipment at the time an emergency condition occurs is so important as to warrant requiring that test reports be submitted to the plant manager or his equivalent. The personnel for this work must be carefully selected and trained. A well administered alarm and shutdown program has been known to be the deciding point between obtaining insurance or being turned down. **End**

Fig. 8. Circuit is closed by flame conductivity; a loss of flame causes an alarm.



The shrill sound of a horn
echoes in every shaft
to guard this mine's air supply against...

CUTOFF!

This is a Pennsylvania coal mine.

Deep down in the earth, hundreds of men are working at the raw sides of jagged black tunnels.

At the surface, three giant fans—each remotely situated in the surrounding countryside—send fresh air sprawling through the many miles of entryway.

The link between man and fan is 4½ miles of Rome control cable!

Engineers at this mine* selected Rome control cable for the nerves of a meticulously engineered control system that guards the mine's vital air supply. A winking light in the control room means everything is running smoothly. *But . . .*

A shrieking horn means trouble! Before gases can accumulate in the mine—jeopardizing the lives of hundreds—repair crews get the signal and start working on the failing fan.

Cable for a control system such as this must be the ultimate in reliability. "We've had experience with Rome's borehole cable and other types of Rome cable," says the chief outside electrician, "so I recommended Rome's control cable for this important job."

It went up very quickly—a crew of seven strung the first 16,000 feet over rugged, wooded and hilly terrain in only 14 days. That's *half* the time such an installation normally takes. The reason? Rome supplied a factory-assembled self-supporting-type cable to save the time and expense of on-the-job assembly.

You depend on cable, too. Just as this coal mine relies on cable to breathe, your plant relies on cable for production—to drive machines and other plant equipment. Like the mine, you can't afford to take chances on power failures.

Rome Cable manufactures various types of thermosetting and thermoplastic control cables to meet specific electrical, environmental, installation and economic requirements. Call your nearest Rome Cable salesman today for help in selecting the precise cable you need.

*Name of mine furnished on request.

NATIONAL ELECTRICAL WEEK
FEB. 7-13, 1960

ROME CABLE
DIVISION OF **ALCOA**

Oklahoma City—Members and guests who were present when the National President William C. Wallin and Regional Vice President Gerald W. Austin presented the charter to the Oklahoma City chapter. Officers of the chapter are: D. K. Andrews, Jr., president; J. W. Gregory, Jr., vice president, and Earl O. Hirk, secretary-treasurer.

ACTIVITIES OF AIPE CHAPTERS

HERE IS A brief report of the recent activities of several chapters of the American Institute of Plant Engineers*:

Oklahoma City

Many members of the Oklahoma City Chapter were present at the official presentation of their charter by National President William C. Wallin and Regional Vice President Gerald W. Austin.

Those present at the charter presentation and appearing in the picture above, were, left to right (first row): E. E. Scott, Tinker Air Force Base; O. M. Wells, Sylvania Electric Products, Inc.; J. L. Johnson, Tinker Air Force Base; H. C. O'Neil, University of Oklahoma Medical Center; and E. O. Kirk, Baptist Memorial Hospital.

Second row, R. C. Stults, Tinker Air Force Base; R. E. Morris (guest); J.W. Gregory, FAA Aeronautical Center; J. Wudi (guest).

Third row, W. F. Stewart, Jonco Aircraft Corp.; C. M. York, University of Oklahoma Medical Center; D. K. Andrews, Hudgins-Thompson-Ball & Associates; G. M. Goodwin and G. McRoberts, of Tinker Air Force Base; and S. T. Husky, FAA Aeronautical Center.

Fourth row, R. R. Hering, Western Electric Co.; W. C. Wallin, Western Electric Co., Winston-Salem, N. C.; G. W. Austin, Gulf Atlantic Warehouse Co., Houston, Texas; W. Glass and H. Crawford, Tinker Air Force Base.

Fox Valley

New officers for the Fox Valley

Fox Valley—George Walters, newly-elected president, accepts gavel from Don Wangelin, retiring president. Officers are, l to r: R. Peck, secy.-treas.; C. Swikert, vice pres.; O. Walters; Wankelin; B. Poest and O. Bombach, directors.

* If you would like more information about this organization, write to Kay Buchanan, Administrative Secretary, American Institute of Plant Engineers, P. O. Box 185, Barrington, Illinois.

Engineers Joint Council—President Elect A. B. Kinzel of the Engineers Joint Council addresses Science Attaches of Foreign Countries. National presidents are, l to r: W. Wallin, AIPE; H. Foote, AIEE; G. Warren, past president, and W. Cisler, president of ASME; and A. B. Kinzel.

Susequehanna—Dick Morris, Editorial Director, Plant Engineering magazine, recently addressed the Susquehanna Chapter. Officers shown with him are, l to r: W. E. Drayton, vice president; R. W. Bond, president; R. H. Morris; R. W. Noel, secretary; and N. B. Rohrbaugh, treasurer.

Chapter of the AIPE are: G. Walters, of Caterpillar Tractor Co., president; C. Swikert, All-Steel Equipment Co., vice president; and Richard Peck, Western Electric Co., secretary-treasurer.

B. H. Poest, Austin-Western Div., Baldwin-Lima-Hamilton Corp., and Otto Bombach, All-Steel Equipment Co., will serve as directors for the coming year.

Engineers Joint Council

Five national society presidents recently attended a panel discussion meeting. It was arranged by the Committee of International Relations of the Engineers Joint Council for the Science Attaches of 25 foreign countries.

The presidents in attendance were: Bill Wallin of the AIPE, Harold Foote of the AIEE, Glen Warren, past president, and Walker Cisler, president of the ASME; and A. B. Kinzel, President Elect of the Engineers Joint Council.

The theme of Mr. Kinzel's address was: U. S. Engineering Organizations and Their Facilities for Aiding Science Attaches.

AIPE representatives of the Committee of International Relations are: Bill Wallin, Western Electric Co., Winston-Salem, N. C.; Frank Bradley, of Stone and Webster Engineering Corporation, Boston, Mass.; and Dick Morris, Editorial Director, PLANT ENGINEERING.

Montreal—Officers are, l to r: W. Rintoul, Canadian Vickers, treas.; W. Henderson, Steel Co. of Canada; G. Gallagher, Canadian Industries; E. Hall, Imperial Tobacco Co., pres.; and C. Bryan, Canadian Car & Foundry Co., vice pres.

Susquehanna

At their last business meeting in 1959, the Susquehanna Chapter of the AIPE heard an interesting report from Dick Morris about his trip to Russia.

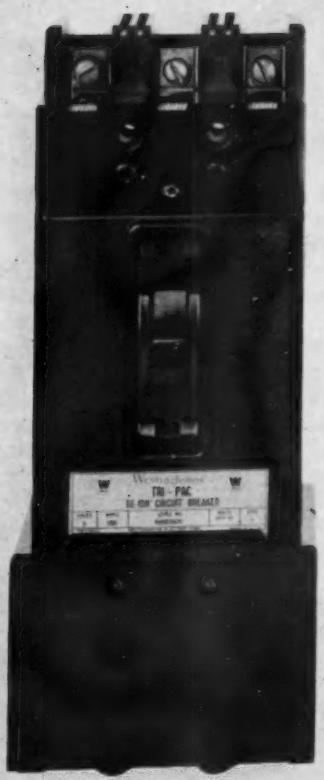
Officers of this chapter, appearing in the picture with Dick Morris, are: R. W. Bond, Allis-Chalmers Mfg. Co., president; W. E. Drayton, American Chain and Cable Co., vice president; R. W. Noel, Borg-Warner Corp., York Div., secretary; and N. Rohrbaugh, P. H. Glatfelter Co., treasurer.

Montreal

Members of the Montreal Chapter recently held a general meeting at the Windsor Hotel, Montreal, Quebec. The speaker for the evening was M. Smith, of Canadian Minneapolis-Honeywell Regulator Co. He presented a very interesting talk on the Economics of Industrial Air Conditioning.

Officers of this chapter are: E. C. Hall, Imperial Tobacco Co. of Canada, Ltd., president; C. G. Bryan, Canadian Car & Foundry Co., vice president; and W. V. Rintoul, Canadian Vickers, Ltd., treasurer. G. M. Gallagher, Canadian Industries, Ltd., is chairman of the membership committee. **End**

WHO ELSE MAKES THIS MANY TYPES OF CIRCUIT BREAKERS?



TRI-PAC†
current-limiting breaker for 100,000-amp faults

THERMAL-MAGNETIC
the industry standard

NOBODY BUT WESTINGHOUSE! It's true! Only Westinghouse offers you six complete lines* of circuit breakers–to solve six different kinds of circuit protection problems.

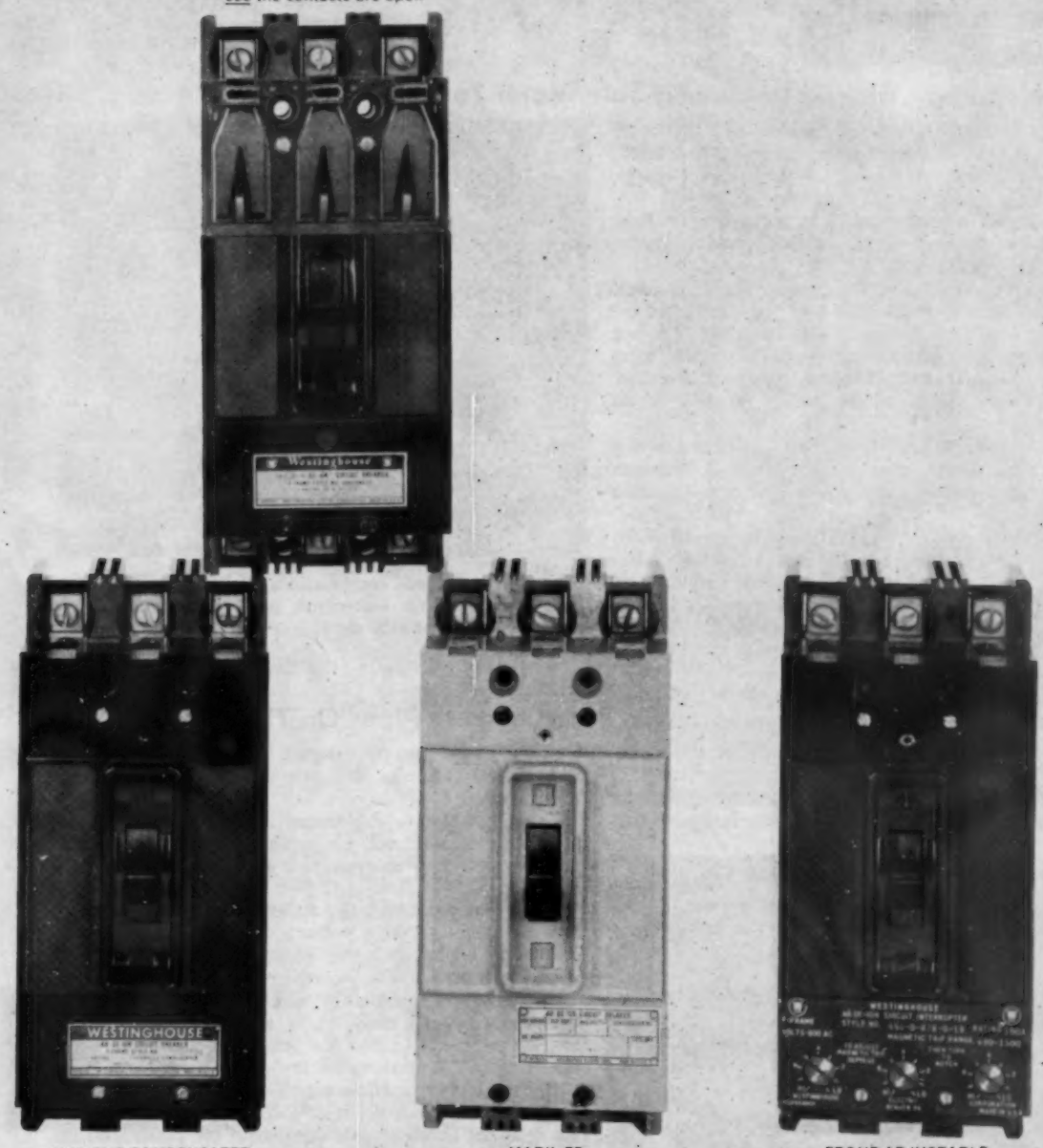
Here's what that means to you: You don't have to accept any "cure-all" type of breaker for your special applications. You can get the right breaker–designed by Westinghouse to do just that special job.

And these aren't high-priced "special" breakers. They're Westinghouse

*Three of these breaker lines are Westinghouse exclusives!—(Saf-T-Vue,† Ambient-Compensated, MARK 75†) †Trade-Mark

For more facts circle 561 on Reply Card

SAF-T-VUE
see the contacts are open



AMBIENT-COMPENSATED
for operation in changing ambients

MARK 75
75,000-amp interrupting capacity!

FRONT-ADJUSTABLE
change the setting with a screwdriver

standards–available now in most any frame size, rating or interrupting capacity–in literally thousands of combinations.

We suggest that next time you've got a problem involving circuit protection, call on Westinghouse. Chances are the answer is already in our warehouse. For further information on industry's only complete line of circuit breakers, please contact Standard Control Division, Westinghouse Electric Corporation, Beaver, Pa. Or call your nearby Westinghouse sales office.

J-30263

YOU CAN BE SURE...IF IT'S Westinghouse

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News from the Plants

Sunshine's Energy Tapped to Convert Salt Water To Fresh

TO DEMONSTRATE THE USE of sunshine as a source of power, Hoffman Electronics Corporation has constructed, and has in operation, "Big Bertha", the largest solar energy converter in the world.

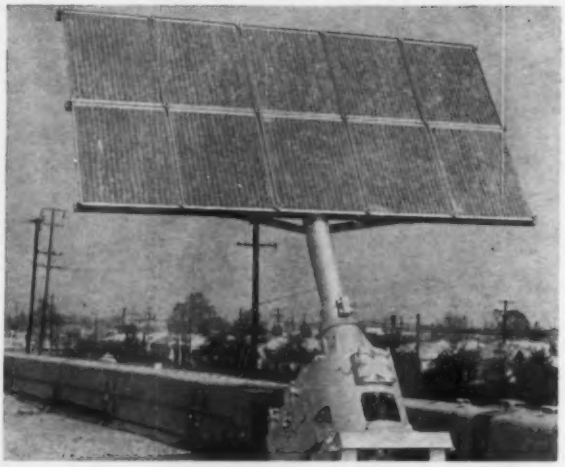
This generator, whose silicon solar cells convert light into electricity, powered a door-opening device in the company's Semiconductor Center.

Big Bertha, developed to power experimental equipment, produces electricity through 7800 solar cells mounted on a single four foot by eight foot panel. The device's swivel base tracks the sun automatically and keeps the solar cells exposed for maximum efficiency. Any surplus energy generated is stored in batteries for use at night or on sunless days.

Operating in the Center's solar energy exhibit are a water pumping station (capable of lifting a one-inch column of water 10 ft.) and a device that converts brine into fresh water.

The salt water converter operates on the principle of ionization. As the brine flows through a series of electrodes, an electric current causes the sodium and chlorine ions forming salt to separate. These ions form in deposits on the electrodes and can later be removed.

Ten individual panels in the converting unit can be



connected in various combinations to provide voltage outputs of 6 to 60, in increments of 6, and current flows ranging from one-half to 5 amps in one-half amp increments.

New Machine Uses Inflatable Forms To Pour Concrete Pipe "On The Run"

CONSTRUCTION MACHINERY that builds "instant concrete pipe" in a freshly-cut ditch at a rate of eight to twelve feet a minute has been developed by Fullerform Continuous Pipe Corp., Phoenix, Arizona. Inflatable rubber and fabric forms, designed by Goodyear Aircraft Corporation engineers, are part of the continuous-operation system.

Using two 300-ft-long forms, inflated with only three pounds per square inch air pressure, Fuller can pour as much as 600 ft of concrete pipe at a time, without interruption.

Prime component of the system is a double-hoppered forming machine that is pulled along the rounded bottom of a ditch, while enveloping an inflated inner form. The inflatable inner form is picked up by the outer form, so tamping devices can literally tuck concrete under it. Half the double hopper, activated by electrically-driven tampers, shoves concrete into the bottom of the ditch, while the other half is forming the top of the pipe.

The hose-type inner form, which is closed during the pour by airtight bulkheads at each end, is easily deflated for removal. This is usually done about two hours after the concrete has been poured.

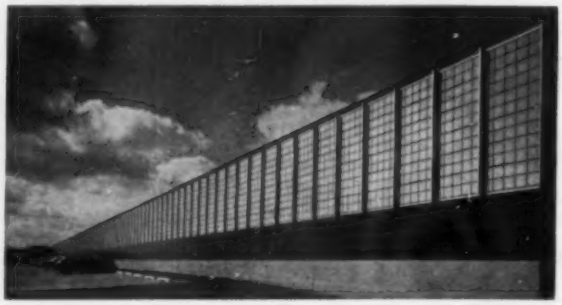
Corrugated Box Plant Features Unusual "Glass Wall" Construction

ONE OF THE WORLD'S most modern plants for the production of corrugated paper boxes has been built by the Owens-Illinois Paper Products Div., near the southern city limits of Chicago. The 224,400-sq-ft facility houses a corrugator capable of turning out more than 65 million sq ft of corrugated board each month.

Architecturally, the plant has an outstanding feature—it is the largest industrial installation of the Thinlite curtain wall system. A product of O-I's Kimble Glass subsidiary, the curtain wall system employs hollow glass tiles set in aluminum frames. The panels are fabricated and glazed before delivery to the building site for erection on the building's steel framework.

The system controls daylight transmission through the 12-in. square tiles which are set into 10-sq ft panels.

The east wall of the plant contains 10,000 individual glass tiles. It is made up of 1000 panels, each two feet wide and five feet high. The other walls in the building are of precast concrete.



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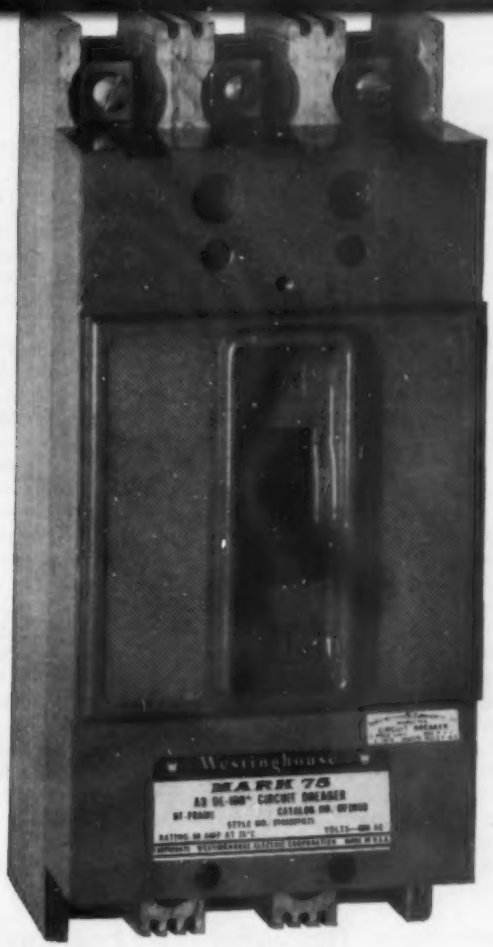

INTERRUPTS 75,000 AMPS

MARK 75 CIRCUIT BREAKER

High interrupting capacity in standard frame sizes

- Mark 75* breaker is ideal for use in network systems.
- Mark 75 breaker is UL approved.
- Mark 75 breaker is available at only a fraction of the cost of other high interrupting capacity breakers . . . and comes in the same sizes and is interchangeable with the standard line of Westinghouse AB breakers.
- Mark 75 breaker is available now in frame sizes HF, HK, HKL and HLM. Only from Westinghouse can you get the right breaker for every application.

For complete information on this new Westinghouse development, contact your nearby Westinghouse sales office or distributor, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pennsylvania. J-30305

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Spherical Radome Fabricated Entirely of Polyurethane Foam

DESIGNED FOR GROUND SHELTERS providing greater dielectric "transparency" to minimize energy loss and boresight error in radar tracking installations, the world's first polyurethane foam radome has been erected at Ottawa, Ontario, by Canada's National Research Council.

The radome, including joints, is constructed entirely of foam. With an equatorial diameter of 26½ feet, the structure consists of 115 pre-molded rigid Hetrofoam panels in nine different geometric shapes and sizes molded by Long Sault Woodcraft Limited, Quebec, Canada.

To facilitate erection and to help hold the panels in place, temporary U-shaped pin fasteners were hammered into predrilled holes. Following this mechanical erection, the panels were "welded" into a continuous foam structure by using additional polyurethane foam as joint mortar, and at the same time the temporary locking pins were removed.

The structure is slightly less than three-fourths of a sphere of 26½-ft internal equatorial diameter; it rests on a 22-ft diameter bolt circle. Panel thickness is 3½ in. with dimensional tolerance set at plus or minus 1/16-in. Based on NRC calculations, the radome is capable of withstanding wind velocities of 200-300 miles per hour.

NRC design requirements called for the use of a fire-resistant polyurethane foam, a requisite which the fabricator met by using Hetrofoam 10 resin, a product of Hooker Chemical Corp., Niagara Falls, N. Y.

In molding the panels for this radome, each panel was molded with a nylon skin surface. The non-structural skins were included simply to "ruggedize" the foam panels against possible sharp impact. Density of foam used was only about 6 lbs per cu ft. A white weather-resistant coating also was applied to the nylon cloth forming the outside surface before the panels were molded.

The radome will be dismantled and moved to another site for electronic testing utilizing actual field radar equipment. Favorable results from the tests could lead to extensive use of such foam, particularly for missile tracking in anti-missile type radar systems.

Seven-Mile "Hot Sulfur" Line Features Built-In Expansion Stresses

DESIGNED TO TRANSPORT molten sulfur from a man-made island in the Gulf of Mexico to the shore at Grand Isle, La., a pipeline has been built by Freeport Sulphur Co. It makes the first use of a special high-strength alloy steel in tubular form.

The sulfur will come from the third largest deposit in the U. S., about 2000 ft beneath the floor of the Gulf. The pipeline, now under test, will be put in operation early this year.

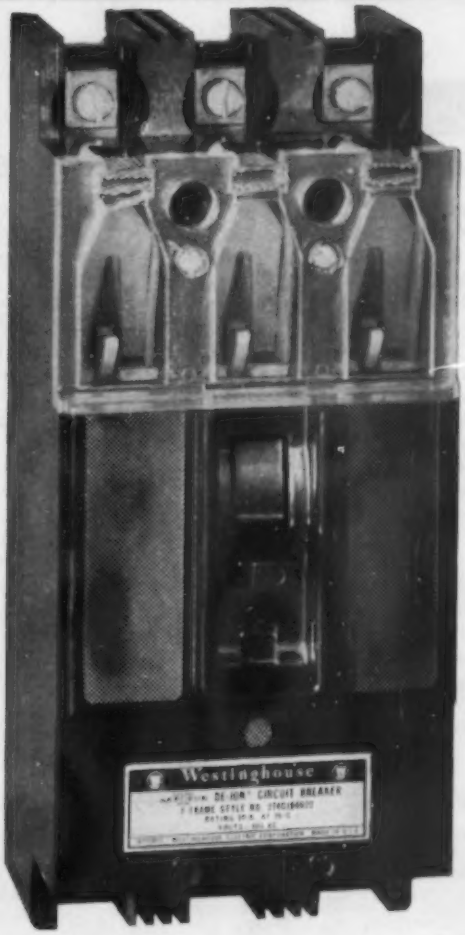
Three concentric pipes make up the line: a 14-in. OD outside protective casing; a 7⅝-in. OD hot water jacket line; and a 6-in. OD sulfur line. The 14-in. outside casing is made of conventional steel pipe, but the inner pipes are made of Jalloy, a manganese molybdenum alloy steel developed by Jones & Laughlin Steel Corp. Because of the unusual thermal stresses involved, Freeport engineers decided that the inner lines had to be made of steel with a minimum yield strength of about 60,000 psi.

The inner lines will have an operating temperature of 300F, which means the seven-mile pipeline will expand about 55 ft in length when heated from 75 F. An unusual solution to this problem of expansion was found and applied to eliminate expansion joints or loops.

After the pipeline was laid, but before it was buried, the outer 14-in. casing was placed in 10,000-psi tension by exerting 270,000 lb pull to both ends of the casing. While in this tension, the ends were fixed to an anchor structure. The inner lines were then heated to 225 F and allowed to expand their normal amount of 35 ft. While in this expanded condition, each end of the inner lines was permanently fastened to the outer casing.

As a result, thermal stresses during operation will be compressive, and when cool, the thermal stress will reverse itself into tension; longitudinal movement of the pipeline is reduced to almost nothing.

In operation, the line will deliver 4500 long tons of sulfur per day, or 470 gpm, to the mainland where it flows into insulated tank barges for transport to refining facilities. Estimated total cost of the pipeline project is $30 million.



CONTACTS ARE VISIBLE!

SAF-T-VUE CIRCUIT BREAKER

You can see the contacts at a glance

- Saf-T-Vue* offers breaker convenience with maximum safety.
- Saf-T-Vue is suitable for use where plant safety codes require visible contacts.
- Saf-T-Vue is available in frame sizes E, EH, F, G, J, JK, K, JKL, KL and LM. Only from Westinghouse can you get the right breaker for every application.

For complete information on this new Westinghouse development, contact your nearby Westinghouse sales office or distributor, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pennsylvania. J-30308

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Automatic System, With Computer Brain, Sorts 30,000 Items

FOUR PARALLEL conveyor lines, installed at the new $5 million dollar distribution center of General Merchandise Co., Milwaukee, Wis., are the primary components in an automated sorting system.

These four conveyors receive various sized packages from feeder conveyors in all parts of the warehouse, and the sorting mechanism, designed by Speaker Sortation Systems, Inc., groups the parcels by order, into bins, preparing them for packaging and shipping.

Order numbers, stamped on each parcel, are read by a key-punch operator, who feeds the numbers into a Ramac 650 computer, as each parcel passes her station.

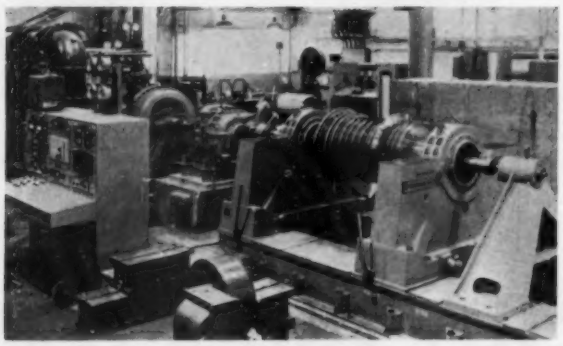
Each parcel proceeds down the line on an individual Fiberglas tray, which tips to one side, dumping the parcel into its appropriate bin, whenever the computer indicates that the bin has been reached. At this point, the computer triggers a solenoid that tips the tray.

Orders are fed to the warehouse in 400-order lots. Two sets of conveyor belts (with 4 belts each) run from the storage section of the warehouse to the sortation system, where each of the four conveyors handles 100 of the orders. Each of the four lines in the system tips alternately to the right or left, which permits the four

conveyors to service eight lines of tote pans, each pan generally representing one order.

The system processes items into orders at a rate of 1600 orders per hour. It is estimated that the system saves, in labor costs each year, its own first cost.

High-Speed, High-Capacity Dynamic Balancing Machine, First in U.S.



CAPABLE OF BALANCING seven-ton units, rotating at 12,000 rpm, a high-speed dynamic balancing machine has been installed by De Laval Steam Turbine Co., Trenton, N. J. The machine is sensitive to bearing vibrations of the order of four-millionths of an inch displacement of center of gravity. It can readily detect, for example, on a 5500-lb rotor spinning at 4000 rpm, unbalance as small as one gram at a 10-in. distance from the axis of rotation.

The machine was built by Carl Schenck, Darmstadt, and shipped to this country. It is designed to accommodate weights from 200 to 14,000 lb, and for balancing speeds from 1000 to 12,000 rpm. This speed range permits preliminary balance correction, and final precision high-speed balancing to be accomplished on the same machine.

Infrared Oven Handles Wide Size Ranges in Drying Furniture

A "FIRST" in furniture manufacturing is a radiant oven capable of handling a wide range of sizes and shapes, drying the final lacquer finish on dressers, chests, desks, bed headboards, night stands and other pieces at the Louisville, Ky., plant of the Kroehler Furniture Mfg. Co. This unique ceramic type infra-red electric oven was designed and built for Kroehler by the driQuik Oven Div. of the Dry Clime Lamp Corp., Greensburg, Ind.

By a combination of multiple temperature zones and product rotation, the final sprayed-on lacquer finish is dried quickly and evenly on all sides.

The pieces of furniture are placed on pallets on the conveyor line before they reach the spray booth. After spraying they enter a flash-off tunnel with a backward-moving forced air exhaust. After 20 minutes in the flash-off tunnel, the pieces enter the driQuik infra red oven, where the drying time is only four minutes.

The pieces revolve several times a minute as they move through the oven on the pallets.

The oven is 17½ ft long, 7 ft high and 8 ft wide. It is divided into six temperature zones, each controlled by a timer which can be set within one degree of temperature.

The flexibility of the oven is demonstrated by the fact that pieces of all sizes and shapes are mixed on the Kroehler production line, and all of them are dried without continually changing the temperature controllers.

PREVENTS NUISANCE TRIPPING

AMBIENT-COMPENSATING BREAKER

No worry where extreme temperature changes exist

- Ambient compensation prevents the breaker from derating the conductors.
- Ambient compensation provides insurance against current interrupting due to false high-temperature influences.
- Ambient-compensating breakers, exclusive with Westinghouse, are available in all frame sizes. Only from Westinghouse can you get the right breaker for every application.

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See why ALCOA ALUMINUM makes a good design habit

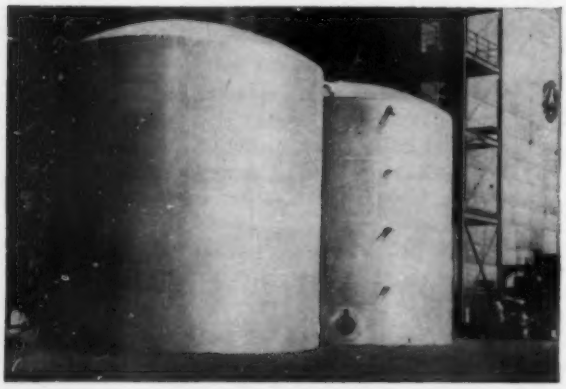
Requirement: A better way to store process liquids and gases
Key to Good Design: Use Alcoa Aluminum Storage Tanks

Whether product storage is an intermediate or final step in your processing operation, ALCOA® Aluminum Storage Tanks can help cut costs and maintain product purity. The production of glacial acetic acid is a prime example. For over 30 years ALCOA Aluminum tanks have been specified for storing this chemical because they resist corrosion and offer real economies in initial investment and in freedom from maintenance costs.

Thousands of aluminum tanks and tank cars have been constructed for the transport and storage of such chemicals as ammonium nitrate solutions, acrylonitrile, cryogenic substances and sour crude oils. Some of the many other products for which aluminum alloy tanks are well suited are listed below.

ALCOA can supply aluminum storage tanks for practically any processing application. They are made in a number of sizes ranging from 580 to 21,480 gal and are available in both horizontal and vertical construction.

Oleic acid is one of the many chemicals often stored in aluminum tanks. Aluminum preserves the color and purity of this product.



These aluminum storage tanks maintain the purity of steam condensate for a large public utility.

Fabricated from 3003 aluminum alloy, ALCOA Standard Storage Tanks measure 10 ft in diameter with varying lengths for different capacities. ALCOA also supplies special storage tanks to many processors. These can be furnished in intermediate lengths and capacities, and in a wide range of aluminum alloys for many process applications.

ALCOA engineers have worked closely with all segments of the process industries for over 40 years, and can help you specify the aluminum alloy storage tanks and other equipment best suited for your particular process application. ALCOA's unparalleled experience in this field is available to you for the asking. Write to the address on the coupon, stating your requirements as specifically as possible. ALCOA's development engineers will welcome the opportunity to work with you on your problems.

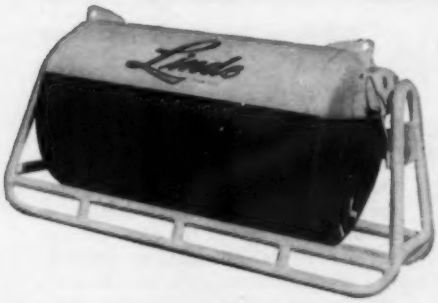
You can also take advantage of the wide selection of free ALCOA literature on aluminum for storage tanks and other process applications. Simply check the booklets you want on the coupon and mail to the address indicated. ALCOA will forward your material promptly and without obligation.

During 1960, ALCOA will conduct engineering conferences in a number of major cities on process industries applications of aluminum. Contact your nearest ALCOA sales office for full particulars and dates.

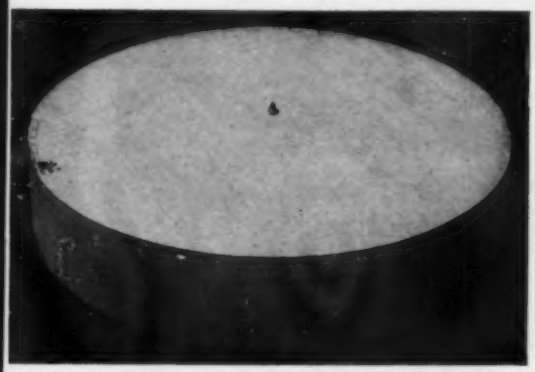
Typical chemicals stored in ALCOA tanks

Acetaldehyde
Acetic acid, glacial
Acetic anhydride
Acetone
Acrylic acid, glacial
Acrylonitrile
Adipic acid
Ammonium carbonate
Ammonium nitrate solutions
Ammonium thioglycolate
Amyl mercaptan
Animal oils
Benzene
Butyl alcohols
Cellulose acetate
Edible oils
Ethyl acetate
Ethyl alcohol
Ethylene glycol
Fatty acids
Gasoline
Glycerine (natural & synthetic)
Glycerol phosphate
Lacquer
Methyl alcohol
Napthenic acids
Naval stores
Nitric acid (above 82% conc.)
Nylon salts
Oleic acid
Phenol
Propyl alcohols
Propylene glycol
Resins
Rosin
Sorbitol
Solvents
Stearic acid
Sugar solutions
Toluene
Trichlorobenzene
Turpentine
Water (distilled or deionized)
Waxes

Fatty acids are not discolored by contact with aluminum.



Aluminum's light weight assures easy handling and storage for this 600-liter nitrogen container. The tank is fabricated from Alcoa Aluminum Alloy 5154.

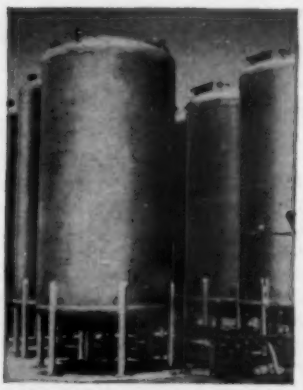


The world's largest all-aluminum tank stores 2½ million gal of ammonium nitrate at 180°F. Prime consideration here was the need for uninterrupted storage service with a minimum of maintenance. The tank stands 26 ft high, and has a diameter of 128 ft.

Typical mechanical properties of Alcoa Aluminum Alloys

Alloy and Temper	Tension			Hardness, (2)	Shear Ultimate ksi	Fatigue Endurance Limit, ksi	Modulus of Elasticity ksi
	Strength, Ultimate	ksi Yield	Elongation % in 2 in. (1)				
5052-O	28	13	25	47	18	16	10,200
5083-O	42	21	22	73	26		10,300
5086-O	38	17	22	65	23		10,300
5154-O	35	17	27	60	22	17	10,200
5454-O	36	17	22	62	23		10,200
5456-O	45	23	24	75	28		10,300

(1) 1/16-in. thick specimen
(2) Brinell; 500-kg load, 10-mm ball



ASME design stress values for various Alcoa Aluminum Alloys (psi at 100 degrees F)

5052..... 6,250 psi
5083.....10,000 psi
5086..... 8,700 psi
5154..... 7,350 psi
5456.....10,500 psi

Alcoa standard tanks are constructed of stock components and are available for fast delivery. They provide the safest storage for a wide variety of chemicals, petrochemicals and petroleum products.

ALCOA
ALUMINUM
ALUMINUM COMPANY OF AMERICA
For exciting drama watch "ALCOA THEATRE," alternate Mondays, NBC-TV, and "ALCOA PRESENTS," every Tuesday, ABC-TV

Aluminum Company of America
867-B Alcoa Building, Pittsburgh 19, Pa.

Please send me the following literature covering Alcoa Aluminum for storage tanks and other uses in the process industries:

- ☐ 10387 Alcoa Standard Storage Tanks
- ☐ 10460 Process Industries Applications of Alcoa Aluminum
- ☐ 10508 Cleaning and Maintenance
- ☐ 20849 Resistance of Aluminum Alloys to Weathering and Resistance of Aluminum Alloys to Chemically Contaminated Atmospheres
- ☐ 20265 Have You Tried Aluminum in Your Refinery?
- ☐ GL93 Aluminum in the Pulp and Paper Industry
- ☐ 20268 Resistance of Aluminum Alloys to Fresh Waters

Name_____

Company_____ Title_____

Address_____

City_____ State_____

For more facts circle 565 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

1—REVOLUTE MACHINES offer retrievable miniatures

The Revolute Continuous Printer and Processor is designed to reduce engineering drawings to a size sufficiently readable in ultimate copy prints. It is announced as a fast, economical means of making, handling and storing prints without disposing of existing facilities or making drastic changes in drafting standards of print-making systems. Reduced size transparencies are made directly from original drawings for immediate reproduction in blueprint or diazoprint equipment—as positives or negatives, right or reverse reading, on paper or film. Transparencies can range from half-size down to ⅛ of original.

The printer, really a giant movie camera, takes a picture of drawings as they move through the machine. It accepts original copy of any length, up to 42 in. wide. Operating speed is from 3 to 30 fpm lineal. Exposure is controlled by conveyor speed, lighting, shutter opening and lens aperature. The processor develops, fixes, washes and dries silver-sensitized

paper or film up to 21 in. wide at speeds to 30 fpm lineal. Although designed for use with the Revolute Continuous Reducing Printer, it can be used to process materials exposed in other equipment. Paragon-Revolute Div., Charles Bruning Co., Inc.

2—WET BLAST UNIT for finishing small parts

Capable of operation from a "sitting down" position, the Consol-Matic is designed for production rate finishing of small parts, such as eyeglass frames and sparkplugs, operations normally handled by women. Two bays are provided at the operating station where work is loaded and unloaded. Moving blast guns, driven by air cylinders, are positioned at each bay. The operator places parts in either or both bays and depresses the foot lever. This begins movement and activation of blast guns. A pre-set timer determines length of blast time as well as speed of gun oscillation. Design of the bays allows for use of masks if decorative effects are to achieved, positioning devices are provided, and guns are individually movable.

The Consol-Matic operates on the aspiration system. It uses fine abrasives (up to 5000 mesh) to impart satin, chemically clean surfaces. The unit is 46 in. high, 24 in. wide, 34 in. deep. It weighs only 130 lb, permitting installation on upper floors of buildings where stress is a factor. Pressure Blast Mfg. Co., Inc.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 237-238.

3—POWDER TOOL burns through concrete, metal

The Oxweld ACL-4 Powder Lance is claimed capable of cutting through concrete, metal or any other known hard material of any thickness. Lengths of standard black iron pipe are fitted into the front end of the ACL-4, which is connected to an oxygen supply and a source of metallic powder mixture. Oxygen and powder are mixed in the pipe and carried to the material being pierced or cut by the consumable pipe. This mixture is ignited at the end of the pipe, producing a reaction, estimated at 8000 F, that melts both ferrous and non-ferrous material in its path. Average consumption rate of consumables per square foot of concrete cut run as follows: 1000 cu ft of oxygen, 40 lb of powder, 10 ft of pipe.

Among construction applications for this lance are making cuts in concrete without noise or vibration, significant where blasting cannot be used, mechanized methods are too costly, or time is a factor. In steel mills, and foundries the lance is suggested for opening slag pockets, cleaning soaking pits, de-skulling ladles, furnace tapping. Operation of the tool is said to be simple for anyone familiar with oxy-acetylene welding and cutting apparatus. Linde Co., Div., Union Carbide Corp.

4—PROTECTIVE SUIT of light, disposable plastic

This lightweight plastic suit is claimed resistant to most acids, alkalis and fire, as well as being waterproof and unaffected by oil or grease. The light yellow polyvinyl chloride slip-over jacket and trousers are made to fit

comfortably over work clothing. Elastic tape at neck, wrists and ankles provides tight fit for additional protection against dust, sprays and splashes. According to manufacturer, suit is priced low enough to be economically disposable. It will be priced at approximately $4.00. Safety First Supply Co.

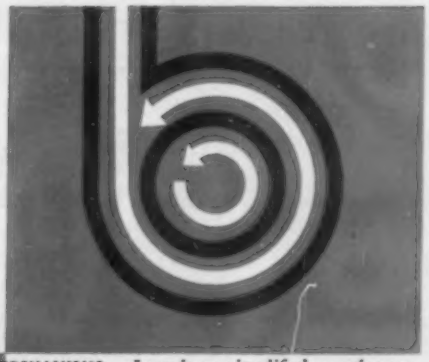
(Continued on following pages)

From Dustex . . .

another revolution in dust collection . . .

DUSTEX ROTO-JET CLOTH COLLECTOR

where cloth is the RIGHT answer . . .
Dustex engineering eliminates usual cloth problems
drastically lowers operating and maintenance costs



1. Torque tube and cleaning air duct
2. Support roller under cloth
3. Blow tube
4. Wrap control roller
5. Drive motor

NO REVERSING MECHANISMS — Ingenious, simplified, continuous cleaning action *in operation.*

NO CLOTH JAMMING — Unique controlled wrap of cloth around blow tube eliminates cloth jamming . . . maintains constant, low friction that requires less driving torque and power.

CLOTH CHANGES EASIER . . . LESS FREQUENT — Dustex Roto-Jet principle keeps cloth cleaner during operation. Gentle, free roller action prolongs cloth life. Easy access simplifies changes when required.

WHERE CENTRIFUGAL COLLECTION IS THE RIGHT ANSWER DUSTEX PATENTED FEATURES PAY FOR THEMSELVES

DUSTEX MINIATURE CYCLONES
D-584 with 100% efficiency at 14 microns
D-560 with 100% efficiency at 12 microns
for economical separation of dust from normal or high temperature gas or air.

MICROCLONE with 99.8% efficiency at 10 microns and smaller for ultra-high efficiency and strict sanitation . . . easily cleaned and sanitized thanks to convenient hinged top tube sheet design.

For Many Ordinary Dusts New, Low-Cost DUSTEX "1600" brings higher Dustex Performance to collectors in Lower Price Range.

THE BIG DIFFERENCE — DUSTEX EXCLUSIVE PATENTED DESIGN
Unobstructed inlet plenum avoids material buildup and plugging.
All tubes are surrounded by cleaned gases and maintained at system temperature to forestall condensation and plugging when systems gases are above dew point.

FOR ALL HOPPER AND BIN DISCHARGES (Under Negative Pressure)
DUSTEX VACUUM VALVE—No motive power required . . . No mechanical parts . . . Maintenance free . . . Bolt in place and forget it.

ON THE JOB DETERMINATION TEST YOUR BEST GUARANTEE
The Dustex Single Tube Determination Test, performed under your actual operation conditions, provides you with exact data required to select the proper Dustex Collector for your plant. No cost or obligation.

SEND FOR "A Simplified Test Method," illustrated booklet describing the Dustex Single Tube Determination Test in detail.

Details and specifications for every model available on request.

DUSTEX PATENTED FEATURES ARE THE BASIS FOR DUSTEX SUPERIOR PERFORMANCE
It will pay you to learn why Dustex has so successfully handled so many process dusts where other collectors have failed.

dustex CORP.

The company with the big name in dust collection

DUSTEX CORP. • P.O. Box 2520 • Buffalo 25, N. Y.

For more facts circle 566 on Reply Card

NEW PRODUCTS

(Begins on page 150)

5—LIMIT SWITCH, vane operated, smaller sized

Announced as a third smaller in size and approximately a third lower in price, this switch can be front or top operated with a vane opening wider than company's previous model. For use in controlling machinery travel, this switch is only slightly higher in

price than a conventional limit switch. Initial forms are expected to be available this month in front or top operated models, normally open or normally closed, single-pole contacts, with or without an indicating light. A mounting plate with either form can be rotated 90 deg to permit flexible mounting arrangements at time of installation.

Internal components of the switch are encapsulated inside the metal enclosure. Operating life of the device is expected to be considerably longer than lever switches when used with conventional low coil current relays. According to company engineers, the switch is capable of over 250,000,000 operations with suitable static control. The switch can operate at any angle. Size of the top-operated form without indicating light is 2-11/16 by 2¾ by 2⅝ exclusive of mounting plate. Operating vane can be any magnetic iron or steel about 1/16 to 5/16 in. thick, 1½ in. wide. General Electric Co.

6—PLASTIC STEPLADDER is fiber glass reinforced

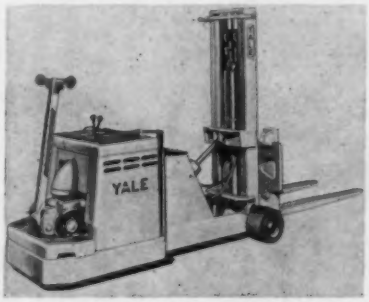
This plastic ladder combines nonconducting qualities of fiber glass reinforced materials with the lightweight strength of metal. When tested under room conditions of 50 per cent relative humidity, according to reports, the ladder did not break down when a maximum of 120,000 v was applied between the rungs. The flat steps and the back rungs are of aluminum. Safety shoes are an integral part. Solid balsa wood core is designed to give excellent deflection results, with strength advantages of a sandwich construction. Ladder comes in 3- to 18-ft sizes, with pail rest for sizes over 3 ft. Putnam Rolling Ladder Co.

7—LIQUID is four-way treatment for concrete floors

Dekote is introduced for providing a positive curing compound for newly poured concrete which, at the same time, hardens, seals and dustproofs. It is a clear, ready-to-use liquid applied to fresh concrete with spray, roller or brush equipment, and is said to have fast drying properties and ability to retain 95 per cent moisture to permit complete hydration and maximum strength. Dekote is also reported to seal the pores of concrete floors against most acids, oils, greases and other foreign materials. Unlike many curing membranes, Dekote does not have to be removed before application of secondary floor treatments, it is pointed out. After a normal curing period (28 days) paints, tile or linoleum can be applied. Tretol, Inc.

8—RIDER-WALKER TRUCK has higher top speed

For faster material movement at less cost, this three-speed Worksaver is designed to give a higher top speed—6.3



mph—with economies in initial price and operating costs. It operates with a series parallel, electric motor which runs off a single 12-v battery. Simplicity of this motor and the single battery with less expensive charger are responsible for the lower initial cost; efficiency of the motor in all speeds is credited with reducing power losses by as much as 33 per cent for lower operating costs. This new motor is built with 40 per cent more copper content and 50 per cent more iron than previous models, company notes, to provide for greater heat resistance and durability.

The first two speeds of the truck are controlled by finger tip, steering controls. The third is actuated by either of two foot treadles—a safety device, since the top speed is faster than normal walking speed and the operator must ride truck at this speed. The Yale & Towne Mfg. Co.

9—TROLLEY CONVEYOR is 3-in., heavy duty system

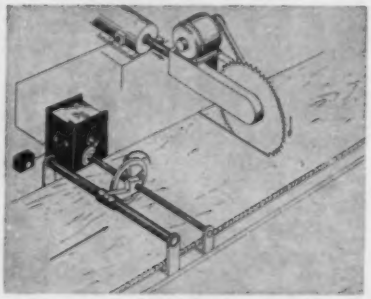
Model 348 consists of a heavy duty, wheeled trolley and standard 3-in. I-beam track with a capacity to handle 250 lb operating on a monoplane.

The wheel is a steel screw machine product designed for a ball bearing with seven ⅜-in. diam steel balls. Trolleys are factory lubricated for running through drying ovens and other high temperature applications to 450 F. Because of standard components, this conveyor is interchangeable with other systems, but specific carriers can be designed to meet user requirements. Features announced include wheel shaft that is an integral part of the bracket forging; a zerk fitting in a recessed area of the bracket to provide all-around protection for the fitting. Rapistan-Keystone, Inc.

10—COUNTER controls length measurements

Automatic control of length measurment of wide materials, particularly those of sheet form, is announced for this miniaturized, shaft-driven revolution counter, the Atcotrol Series 307. Suggested applications include cutting predetermined lengths of lumber, sheet steel, textile fabrics, fiber board, plaster board. It counts shaft revolutions to 1000 rpm and requires only 1¼ oz-in. torque, company says, with repeatability ±0.0025 of dial range.

For surface or flush mounting, the counter has an electrically operated



For more facts circle 567 on Reply Card ——→

THE ATLAS SLING IS DIFFERENT!

MACWHYTE • ATLAS SLINGS — ROUND BRAIDED — KENOSHA WISCONSIN

It's an All-American on your safe handling team!

Take a close look at the braided construction of an Atlas Sling!

The eight-part Atlas Sling is made by braiding two endless Monarch Whyte Strand wire ropes — one right lay and one left lay. This produces an unusually flexible, light-weight, perfectly balanced sling in which all ropes react the same under load.

The Macwhyte Atlas Sling hugs the load with a safe, full-grip contact . . . and the braided construction resists kinking and speeds handling.

Macwhyte Slings are made in many standard types and sizes. We'll make slings to your specification or give you an engineered recommendation. Ask for sling circular 5308R, free on request.

Lightweight!

Resists kinking, speeds handling!

Highly flexible!

MACWHYTE Wire Rope COMPANY

2900 Fourteenth Avenue, Kenosha, Wisconsin, U. S. A.
Wire Rope • Slings • Cable Assemblies

190

NEW PRODUCTS

(Begins on page 150)

clutch which connects input rotation to the traveling dial pointer. An enclosed gear train reduces input shaft revolutions to a single turn representing full scale of the dial. Once adjusted to range, the dial setting remains fixed. The knob-operated setting hand determines number of input revolutions required before control action occurs. Since clutch action permits automatic reset, the knob need not operate after initial adjustment until a new setting is required. The counter also has application in providing automatic control for piece counting, tape dispensing, coil winding, fluid metering, material feeding, depth control. Automatic Timing & Controls, Inc.

11—STORAGE RACKS, super strong, easily erected

For pallet, skid, die, drum, bar or bulk rack use, these racks are made of high carbon rail steel and are described as easily erected and readily adjustable. They use a dual-angle construction with positive locking feature. They are available in standard sizes or to specifications. Met-Fab Inc.

12—GASKET TAPE fits tight around the bolts

This double-seal asbestos gasket tape is designed for industrial usages requiring a uniform gasketing that fits around bolts or studs to form an efficient double seal. Tape is available in

three types—a plain wire inserted folded asbestos tape with an open lattice, or bolt space, center (Style 746); a plain wire inserted asbestos tape woven flat to desired dimensions and bolt space openings (Style 738); and a plain woven non-metallic asbestos tape (Style 748). Various widths and thicknesses are available, and all styles can be furnished plain or graphite coated. Union Asbestos & Rubber Co.

13—COMPUTER SYSTEM requires no decoding

The ISI 609 is announced as a solid state process computer system which simultaneously provides data for on-line operation and analysis, off-line analysis, and off-line analysis using on-line data. A direct English and decimal system operator-control panel permits operator to change or read out instantly any process data constants or variables, company says, without decoding. Programming includes complete machine order code. 4000 index registers and fast arithmetic, such as 2.1 milliseconds for obtaining square root or multiplying. Random access magnetic core memory covers 8000 words, company says, and gets to any point instantly. Stored data constants and operating programs can be modified or corrected while machine is running. Internally stored program can be automatically modified by external commands from feedback signals, from operator or from decisions within machine itself. Information Systems, Inc.

14—FAUCET SEAT WRENCH fits hex and square sockets

Engineered for fast, easy removal and installation of replaceable faucet seats, this single wrench is said to fit all seats now being manufactured—both hex socket and square socket. Of hardened tool steel, the 8-in. long Supreme Faucet Seat Wrench No. 1356 is claimed to remove any replaceable seat no matter how or where the faucet or valve is mounted. The Schaul Mfg. Co.

15—ENAMEL COATING goes on over damp walls

You can paint over damp walls and ceilings, it is announced, with Super Dampcoat Enamel. Formulated for application over heavily "sweating" surfaces, coating is made to withstand

G-B SNAP-ON DISTRIBUTORS

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(See ad on facing page)

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ALBANY, N. Y., Hudson Valley Asbestos Corp.
ALBUQUERQUE, N. M., Mt. States Insulation Co.
AMARILLO, Tex., McDonald Engineering & Insulating Co.
ATLANTA, Ga., Reynolds Aluminum Supply Co.
AUSTIN, Tex., Cinbar Engineering Co.
BALTIMORE, Md., Leroy Insulation Co.
BANGOR, Me., Eastern Glass Co.
BATON ROUGE, La., Eagle Asbestos & Pkg. Co.
BEAUMONT, Tex., Solar Supply Co.
BILLINGS, Mont., Big Horn Supply, Inc.
BIRMINGHAM, Ala., Reynolds Aluminum Supply Co.
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BOSTON, Mass., Homans-Kohler, Inc.
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CHARLESTON, W. Va., Asbestos & Insulating Co.
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GREENSBORO, N. C., Starr Davis Co., Inc.
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INDIANAPOLIS, Ind., Lyon Lumber & Supply Co.
JACKSON, Miss., Paine Refrigeration & Supply Co.
JACKSONVILLE, Fla., Eckles Distributors, Inc.
Reynolds Alum. Sup. Co.
JOPLIN, Mo., Joplin Cement Co.
KANSAS CITY, Mo., Central Supply Co.
KEWANEE, Ill., Mechanical Insulation Co., Inc.
LAKE CHARLES, La., Solar Supply Co.
LITTLE ROCK, Ark., Gunn Distributing Co.
LOS ANGELES, Calif., Western Fibrous Glass Prod. Co.
LOUISVILLE, Ky., General Insulation & Roofing Co.
MACON, Ga., Industry Insulation Co.
MARIETTA, Ohio, Asbestos & Insulating Co.
MEMPHIS, Tenn., John A. Denie's Sons, Co.
Gibbons Supply Co.
MIAMI, Fla., Reynolds Aluminum Supply Co.
Southern Metal Products Co.
MILWAUKEE, Wisc., F. R. Dengel Co.
MINNEAPOLIS, Minn., Asbestos Products, Inc.
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NEW YORK, N. Y., Eastern Steam Specialty Co.
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OKLAHOMA CITY, Okla., Ball Distributing & Engr. Co.
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ORANGE, Conn., Insulation Supply Co.
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RALEIGH, N. C., Reynolds Aluminum Supply Co.
RAPID CITY, S. D., Robbins & Stearns Wholesale
RICHMOND, Va., Reynolds Aluminum Supply Co.
ROANOKE, Va., C. E. Thurston Co.
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SAN ANTONIO, Tex., San Antonio Machine & Supply Co.
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SEATTLE, Wash., Western Fibrous Glass Products Co.
SHREVEPORT, La., Frith Sales Co.
SOMERVILLE, Mass., Insulation Products, Inc.
ST. LOUIS, Mo., The Stovey Company, Inc.
ST. PAUL, Minn., Asbestos Products, Inc.
SULLIVAN, Ill., Lewie David, Inc.
SYRACUSE, N. Y., Burnett Process, Inc.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TULSA, Okla., Ball Distributing & Engr. Co.
TUPELO, Miss., Paine Supply Co.
WASHINGTON, D. C., Walter E. Campbell Co., Inc.
WEST PALM BEACH, Fla., Southern Metal Prod.
WICHITA, Kans., General Metals, Inc.

Insulation Contractor: Precision Insulation Co., Houston

"30% saving on handling and wastage alone . . . with G-B SNAP*ON®"

This experience of an insulation contractor highlights one of the many advantages of G-B SNAP*ON, the original one-piece pipe insulation molded of fine glass fibers:

*"When we recently installed about two miles of G-B SNAP*ON and a rigid type insulation, we had a good opportunity to compare the two. Much of the job required dragging insulation through wet, muddy crawl spaces. The way G-B SNAP*ON stood up under this abuse, with practically no waste, convinced me it is the ideal pipe insulation. We figure we saved 30% on handling and wastage alone by using G-B SNAP*ON."*

Featherweight 3′ and 6′ sections of G-B SNAP*ON also cost less to apply! "SNAP"—and the pipe is covered, even in tight spots and close quarters. So outstanding is its thermal efficiency that 1½″ G-B SNAP*ON is thermally superior to most 2″ insulations—more permanent, too. For your next pipe insulating job, be it large or small, hot or cold, specify G-B SNAP*ON and discover its many outstanding features for yourself!

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Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation
Couplings and fittings for plain and grooved end pipe

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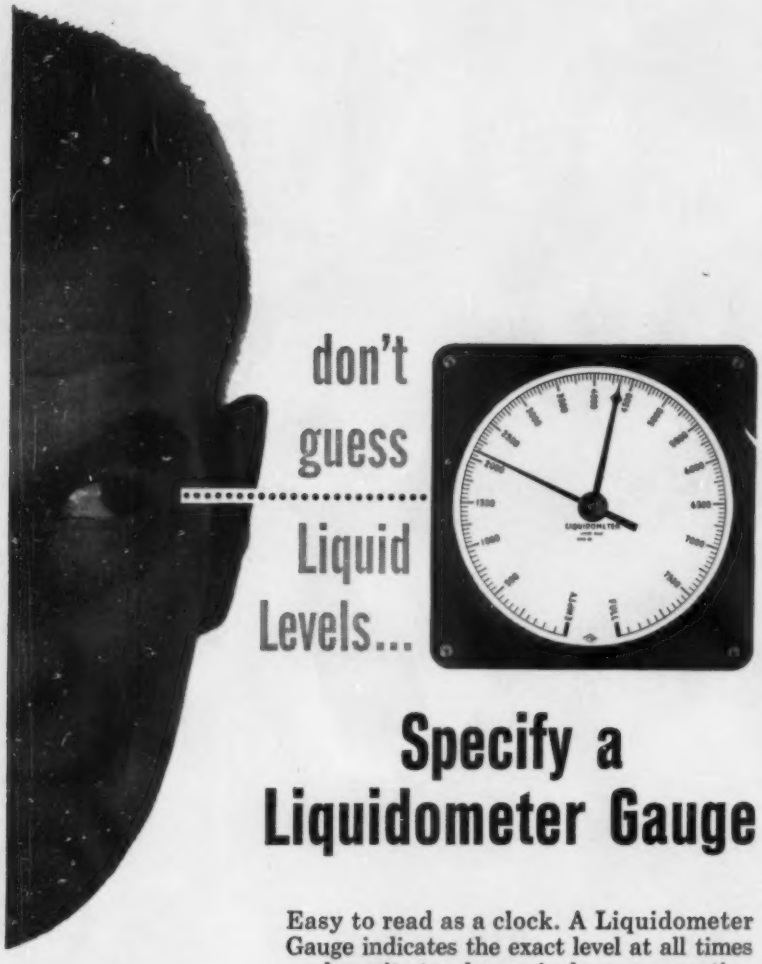


Specify a Liquidometer Gauge

Easy to read as a clock. A Liquidometer Gauge indicates the exact level at all times ...shows it at a glance. And gauge operation is completely automatic—as far as 250 feet from the tank—without need for auxiliary power of any kind.

A Liquidometer Tank Gauge measures virtually any liquid. It's simple to install—requires no maintenance. Many have provided over 30 years of efficient, dependable service. All are approved by Underwriters' Laboratories and Factory Mutual.

Whether your gauging needs require an automatic Liquidometer Gauge, a hydrostatic Levelometer or a tank-site-indicating Direct Reader, you'll get the best by specifying Liquidometer. For complete details write Dept. B.

Since 1920 ...of proven quality

THE LIQUIDOMETER CORP.

LONG ISLAND CITY 1, NEW YORK

For more facts circle 569 on Reply Card

NEW PRODUCTS

(Begins on page 150)

destructive action of chemical corrosion. Being an all synthetic product, it contains no organic host for fungus, and has low odor which is said to affect neither food products nor applicators. Described as non-toxic and resistant to most acids and alkalis, hard and tough with high glass retention, it comes in six colors plus white in full gloss, in flat white and two semi-gloss finishes. The Wilbur & Williams Co., Inc.

16—INORGANIC BOARD is light and strong

Unarcoboard is announced as an inorganic sheet material that is incombustible and combines light weight and structural strength. Suggested uses include ovens, ceilings, partitions, backup board, duct work, firewalls, housings and breechings etc. This white

board comes in sheets up to 4-by-8 ft in size and can be worked like wood —sawed, planed, sanded or drilled, nailed and screwed. Its smooth surfaces do not require finishing, it is pointed out, but Unarcoboard can be laminated, covered by veneers, or painted with alkali resistant paint.

Composed of asbestos and other inorganic materials, the structure of the board is homogenous throughout to provide uniform control of heat transfer. According to manufacturer, the product will not swell, crack or warp, and its structural properties are practically unaffected by moisture, immersion in water, steam, fumes or temperatures to 1200 F. Density per cubic foot ranges from 20 to 75 lb; compressive strength of 2400 psi is obtained with 35 lb density. Unarcoboard comes in five thicknesses from 1-3 in. Union Asbestos & Rubber Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 237-238.

17—GREASE CARTRIDGE with multi-purpose lubricant

The E-Z Load Cartridge is packed with Gulflex-A, a multi-purpose lithium base grease, and fits all cartridge-

How three companies use . . .

G-E Power Grooves for Sales Lighting. If you have products to display and sell, G-E Power Groove Lamps can play a vital role, as in the Fontius Shoe Stores, Denver, where 300 footcandles make shoe selection easy—and *fast!*

G-E Power Grooves for High Lighting Levels. Assembly Products, Inc., Chesterland, Ohio, gets 250 footcandles with mighty G-E Power Grooves—eliminated supplementary lighting, and saved *50¢ a square foot initial cost* at the same time!

General Electric Power Groove Lamps

. . . and get the lighting results they want

Conclusion:

You get more and more light for your money . . . year after year . . . with G-E Lamps

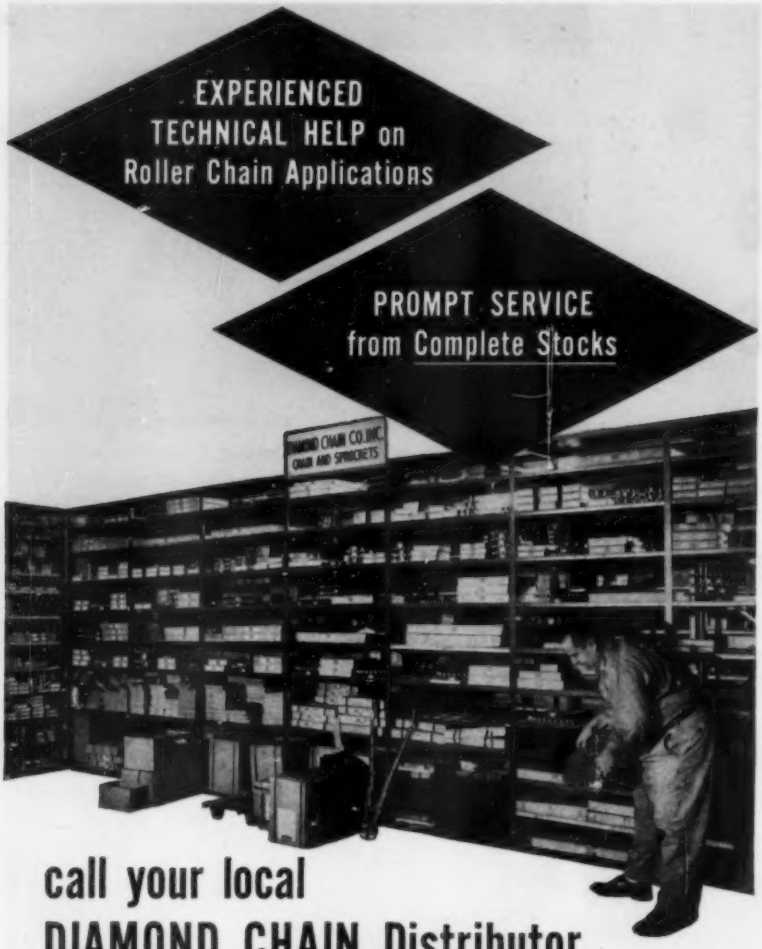
Ask your General Electric Lamp distributor which G-E Lamps are *best* for your particular job. General Electric Co., Large Lamp Dept. C-01, Nela Park, Cleveland 12, O.

G-E Power Grooves for Low Initial Cost. In Murray Hill, New Jersey, Bell Laboratories specified 100 footcandles in this engineering office and got it most economically with General Electric Power Groove Lamps.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 570 on Reply Card



call your local DIAMOND CHAIN Distributor

Your DIAMOND Distributor can help you work out efficient, cost-cutting roller chain installations for power transfer, precision timing and conveying applications. He has, *in stock*, a good selection of DIAMOND roller chain and sprockets. He maintains large stocks of spare parts—connecting links, roller links—individually packaged in weatherproof, transparent plastic bags for easy shelving and identification.

Coast-to-Coast Sales and Service—Call your DIAMOND Distributor for *prompt service* for all your roller chain needs. Look under "Chains" or "Chains, Roller" in the Yellow Pages of your phone book . . . or write direct to DIAMOND for his name.

Catalogs and Engineering Service—Your DIAMOND Distributor can supply you with catalogs giving full information on roller chain and sprockets. Factory engineering service on special problems is also available through your DIAMOND Distributor.

DIAMOND CHAIN COMPANY, INC.
A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES
Dept. 614 • 402 Kentucky Avenue, Indianapolis 7, Indiana
Offices and Distributors in All Principal Cities

DIAMOND ROLLER CHAINS ®

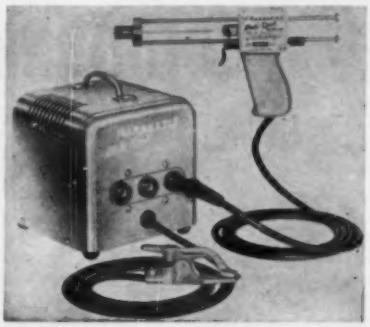
Find Your Nearest Distributor in The 'Yellow Pages'

For more facts circle 571 on Reply Card

NEW PRODUCTS

(Begins on page 150)

type grease guns. It offers a quick insert-use-discard method of handling to simplify lubrication and reduce grease loss; it is sealed to eliminate contamination. Bulletin SP-9672 describes it. Gulf Oil Corp.

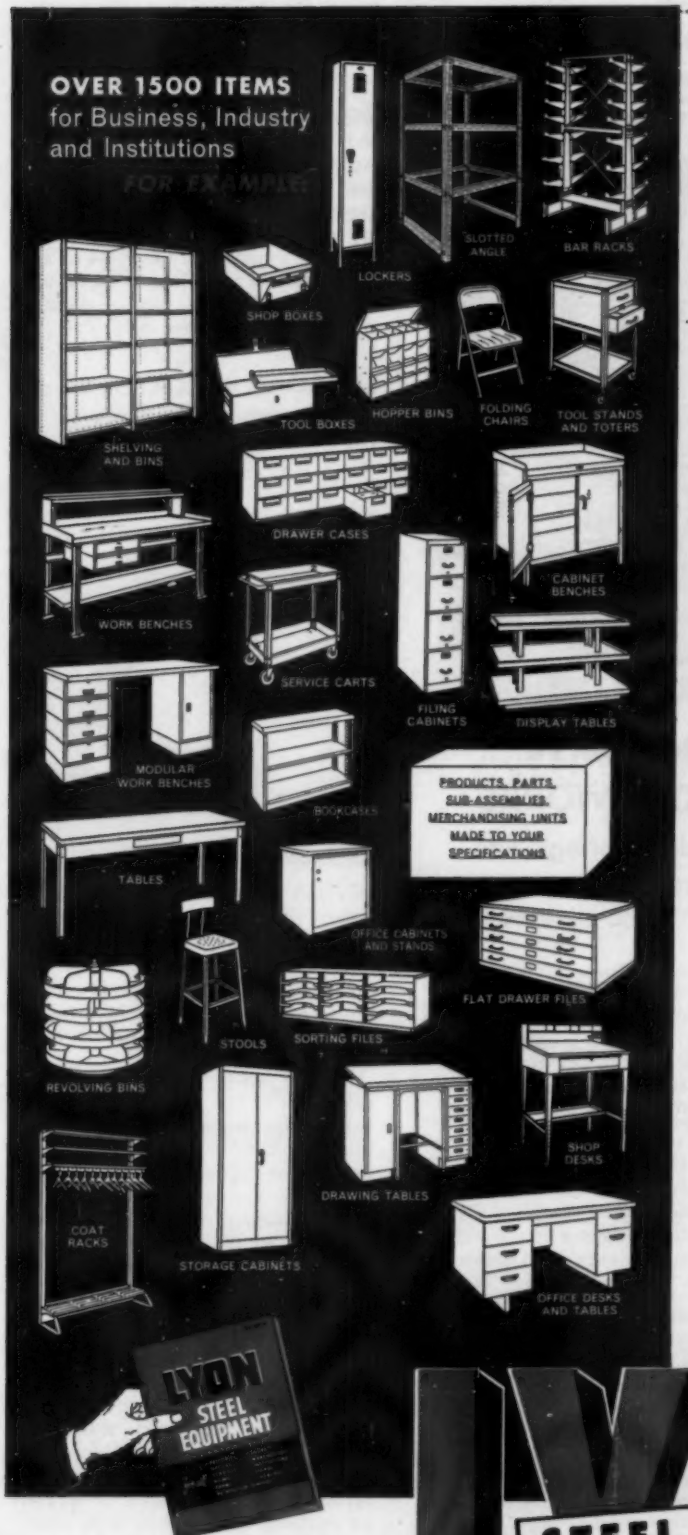


18—WELDING GUN has semi-automatic operation

Redi-Spot Welding Gun is designed to provide semi-automatic, controlled penetration and one-man operation from one side only. It is described as ideal for use anywhere that a number of spot welds of consistent and controlled penetration are to be made and where access from only one side is possible. Gun is used in combination with arc voltage reducer. Welder operates properly on all light gage mild steels, company says, without cleaning or special preparation. In operation, the arc voltage reducer cuts the open circuit and arc voltage of conventional a-c welders and the "Feed-Lock" mechanism in gun controls electrode burn-off—automatically cutting off arc when proper penetration and metal deposit have been made. Marquette Mfg. Co.

19—WORK GLOVES feature oil, water resistance

Terri-Cord work gloves don't absorb oil or water or become heavy and soggy, it is announced. Hundreds of closely knitted loops per square inch



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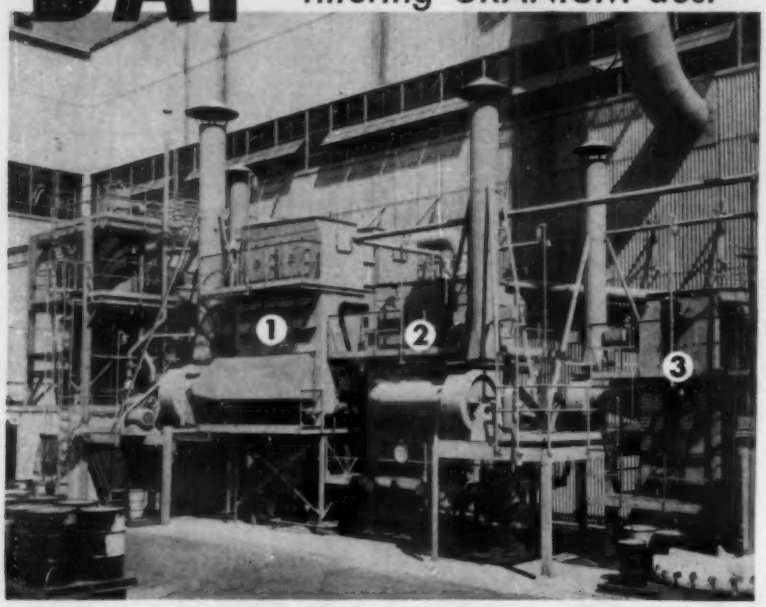
For more facts circle 572 on Reply Card

DAY *plant proven dust control filtering URANIUM dust*



3 DAY "AC" Dust Filters Serve MALLINCKRODT CHEMICAL WORKS

URANIUM DIVISION, AEC Weldon Springs Site

Shown above are 3 DAY "AC" dust filters. Filters No. 1 and 2 are collecting magnesium fluoride (M_gF_2) slag dust and U_3O_8 from slag grinding and similar operations. Filter No. 3, on the right, serves to filter uranium tetrafluoride (UF_4).

Equipment with high filtering efficiency is an imperative requirement for an installation of this type. These DAY filters meet this requirement. They capture sub-micron particles with 99.99+% efficiency because they are designed around the Hersey principle of air filtration which uses felted filter media. Filter media porosity is maintained automatically and continuously by high velocity reverse jet air. This assures stable back pressure.

Throughout many industries DAY equipment is preferred because it's *plant proven*. It means DAY not only offers high efficiency and pure, clean air but higher recovery of valuable product. DAY "AC" reverse jet filters are also preferred because they occupy a minimum of space and provide higher air handling capacities (4 to 5 times higher than non-reverse-jet type filters).

For more facts about the services and equipment DAY offers, consult your DAY application engineer, and for complete facts about DAY filters write toDAY for Bulletins F-75 and G-579. They contain helpful planning information and air engineering data.

The **DAY** *Company*

SOLD in UNITED STATES by
The DAY SALES Company
807 Third Avenue N.E.
Minneapolis 13, Minnesota

MADE and SOLD in CANADA by
The DAY Company of Canada Limited
Rexdale (Toronto), Ontario, Canada
Fort William, Ontario, Canada

Representatives in Principal Cities

EXPERIENCE ENGINEERED . . . LABORATORY TESTED . . . PLANT PROVEN
Dust Control • Pneumatic Conveying • Bulk Storage
EQUIPMENT . . . SYSTEMS . . . INSTALLATION

For more facts circle 573 on Reply Card

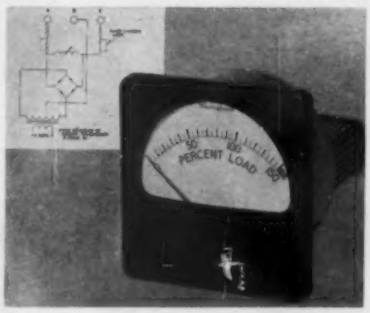
NEW PRODUCTS

(Begins on page 150)

prolong glove wear, company says, and cushion and protect the hand. According to manufacturer, perspiration will not harden or stiffen the gloves, they retain their shape and are washable with little shrinkage. They are available in 18-oz, 24 oz and 32-oz weights in knit-wrist, band-top, gauntlet, reversible men's, women's styles. Advance Glove Mfg. Co.

20—LOAD INDICATOR for use on induction motors

For either single- or three-phase, 50- or 60-cycle induction motors, the C-371 Motor-Load Indicator is designed for use with a 5-amp current transformer. The panel instrument



measures the useful or working component of load current. Since induction motors operate at different power factors, dependent on load, this device is said to give more indication at light loads, without sacrificing full-load indication. The meter is calibrated for 190-280 v, or for 350-550 v. Two accessible resistor links permit operation of 190-280 v. Removal of resistor links increases meter voltage range to 350-550 v. The indicator is housed in a flush-mounted case and may have a 4-in. square, or 4½-in. round mounting flange. Westinghouse Electric Corp.

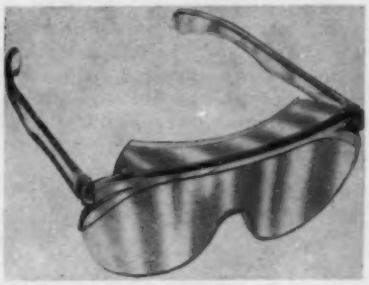
21—SOLVENT-DETERGENT is highly penetrating

Teclene 135 is announced as a solvent-detergent of high penetrating and emulsifying action, consisting of Teclene modified with chlorinated solvents of low volatility to remove heavy oil, grease and other contaminants. It may be brushed or sprayed on surface, then rinsed with water, steam or solvents. Addition of three parts water to seven parts Teclene 135 forms a gel which may be applied with brushes to vertical surfaces, yet rinsed with water. A liquid of the viscosity of light oil, Teclene 135 is

said to have no flash point, be of low toxicity, and to be usable in cleaning all metals. Tect, Inc.

22—SAFETY SPEC for plant visitors to wear

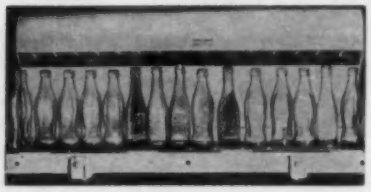
Inexpensive, lightweight but effective eye protection that can be worn all day—even over prescription glasses—are features announced for the VS3



Visitor Spec. It weighs less than 1 oz and offers frontal eye protection against light impacts, foreign particles or dust. The wide brow rest and 0.080-in. thick lens of one-piece construction. Library type temples fit any head. Glasses have green or clear lens, come in polyethylene bags. Willson Products Div., Ray-O-Vac Co.

23—INSPECTION LIGHT checks bottles, containers

For visual inspection of bottles and containers in production line filling assemblies, the Terriss Inspection Light may be mounted on a conveyor. It enables instant detection of broken, cracked, or dirty bottles. It offers a top view of the neck as well as the complete bottle. In liquid and dry packaging, it can detect filling line level as well as foreign objects in empty plastic containers or liquid filled plas-

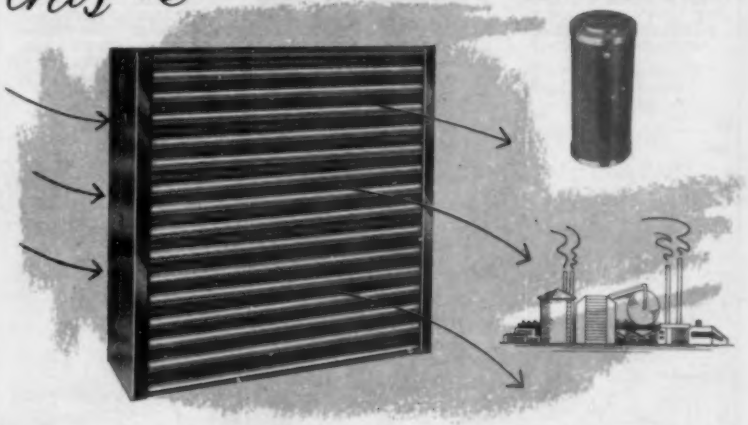


tic containers. For semi-opaque brown or amber colors, sodium vapor lights can be furnished. Lights come in 18-, 36- and 48-in. lengths with or without spot magnifying lens. Processing speeds of 60 to 300 units per minute are possible depending on size of light selected. Terriss Div., Consolidated Siphon Supply Co., Inc.

24—FLEXIBLE SHAFTS for extra heavy duty service

These power drive flexible shafts are designed to transmit a great deal of

this is DOREX



27 years of Research, Development, and Application make it the most effective, economical method of AIR RECOVERY and ODOR CONTROL

WHAT DOREX IS . . .

Dorex equipment is designed in two basic types—C Cells and H Canisters—Dorex acts exactly like a gas mask, using activated carbon to adsorb air-entrained odorous, gaseous, and vaporous irritants and impurities. As a direct result of the carbon's highly effective purging action, stale and/or contaminated air is purified and reconverted to its original healthful freshness, ready for sanitary re-use in air conditioning systems. The Dorex process eliminates the biggest obstruction to maximum economy in air conditioning.

HOW DOREX WORKS . . .

Dorex efficiently solves the several air pollution problems menacing business, industry, and the general public: purification of severely contaminated intake air (smog); purification of recirculated air; purification of contaminated exhaust air.

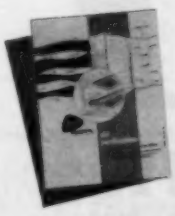
WHERE DOREX IS USED . . .

Dorex is used throughout business and industry, in combination with air conditioning and ventilating systems . . . in office buildings, department stores, food processing plants, distilleries, electrical and electronics plants, atomic energy labs, paper factories . . . virtually anywhere that polluted air creates severe problems of offensive odor, equipment corrosion, and toxic atmospheric conditions.

WHY DOREX IS THE MOST EFFECTIVE

Dorex engineers always select the type of carbon that years of Connor research and experience have proved is most successful in different given situations. There is *no single all-purpose* type of activated carbon that can be applied successfully in all air recovery and air purification situations.

CONNOR... for Constant Comfort Conditions



Request—on your letterhead, please—copies of Dorex Bulletin 108A and the authoritative air purification textbook available only from Connor, "Air Conservation Engineering".

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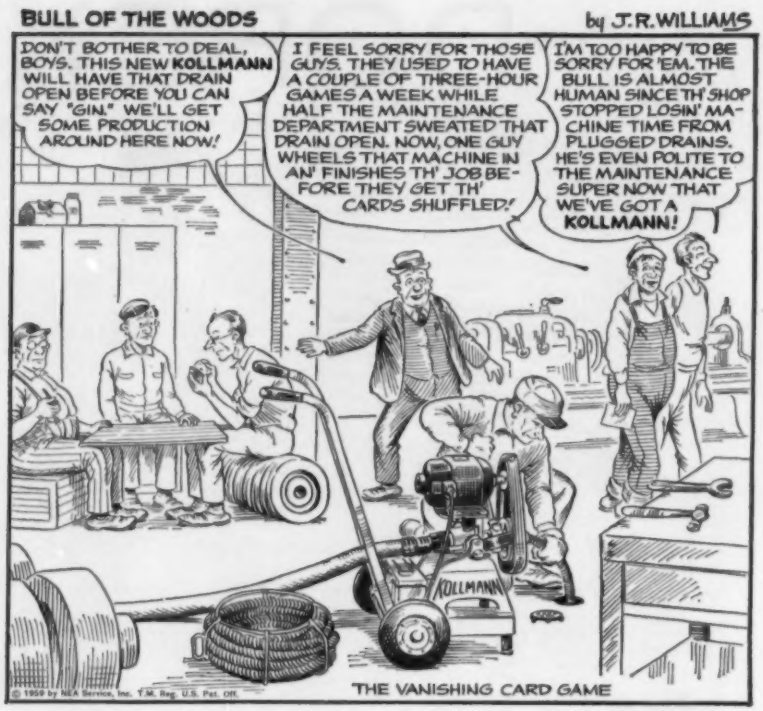
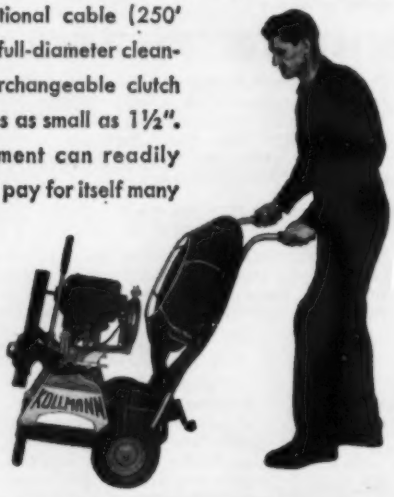
CONNOR ENGINEERING CORPORATION dorex® air recovery

For more facts circle 574 on Reply Card


BULL OF THE WOODS
by J.R.WILLIAMS
DON'T BOTHER TO DEAL, BOYS. THIS NEW KOLLMANN WILL HAVE THAT DRAIN OPEN BEFORE YOU CAN SAY "GIN." WE'LL GET SOME PRODUCTION AROUND HERE NOW!
I FEEL SORRY FOR THOSE GUYS. THEY USED TO HAVE A COUPLE OF THREE-HOUR GAMES A WEEK WHILE HALF THE MAINTENANCE DEPARTMENT SWEATED THAT DRAIN OPEN. NOW, ONE GUY WHEELS THAT MACHINE IN AN' FINISHES TH' JOB BEFORE THEY GET TH' CARDS SHUFFLED!
I'M TOO HAPPY TO BE SORRY FOR 'EM. THE BULL IS ALMOST HUMAN SINCE TH' SHOP STOPPED LOSIN' MACHINE TIME FROM PLUGGED DRAINS. HE'S EVEN POLITE TO THE MAINTENANCE SUPER NOW THAT WE'VE GOT A KOLLMANN!
KOLLMANN
© 1959 by NEA Service, Inc. T.M. Reg. U.S. Pat. Off.
THE VANISHING CARD GAME

YES, THE KOLLMANN "500" CLEARS *Any* STOPPAGE QUICKLY...THOROUGHLY...

● Designed for industrial use, the "500" makes fast work of stubborn flow line stoppages, eliminates trouble and "down time"... and anyone in the maintenance crew can operate it. The dolly-mounted "500" handles up to 150' of sectional cable (250' with larger power units) for full-diameter cleaning of lines 3" to 10". Interchangeable clutch jaws quickly adapt it to lines as small as 1½". *Every* maintenance department can readily justify this machine... it will pay for itself many times over.



See the full Kollmann line at your distributor, or write for literature.

KOLLMANN
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Erie, Pennsylvania • Phone: Erie 99-1102
Leading Designer and Manufacturer of Drain Cleaning Equipment Since 1936

For more facts circle 575 on Reply Card

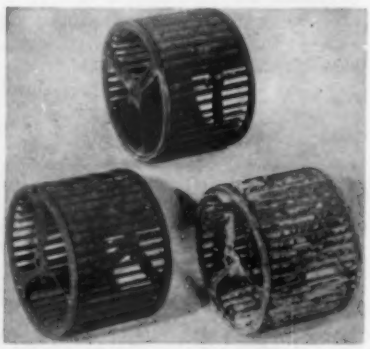
NEW PRODUCTS

(Begins on page 150)

rotary power over any curved path. The S100, which has a 1-in. diam core, transmits up to 760 in.-lb of torque at 600 rpm, and the S125, with a 1¼-in. diam core, up to 1650 in.-lb at 500 rpm (about 10 hp). Heart of this flexible shaft design is a heavy duty core made of layers of tightly wound music wire. The heavy duty flexible casing is lined with spring steel, reinforced with wire braid, and covered with an oil-resistant, Neoprene-impregnated fabric and an abrasion-resistant rubber jacket. The shafts have a square slip coupling at one end with enough play to take care of slight changes in length due to varying torque loads. Couplings of various bore are available for connecting up at each end. Steel-backed bronze sleeve bearings support the core at each end of the shaft Stow Mfg. Co.

25—BLOWER WHEEL, porcelainized, resists corrosion

These porcelainized enamel blower wheels and assemblies are reported to exhibit exceptional resistance to corrosion. They are designed for process equipment, air conditioning equipment, cooling towers, evaporative condensers and other applications where corrosion or abrasion are factors. Wheels are available in 10- through 20-in. sizes, in capacities to

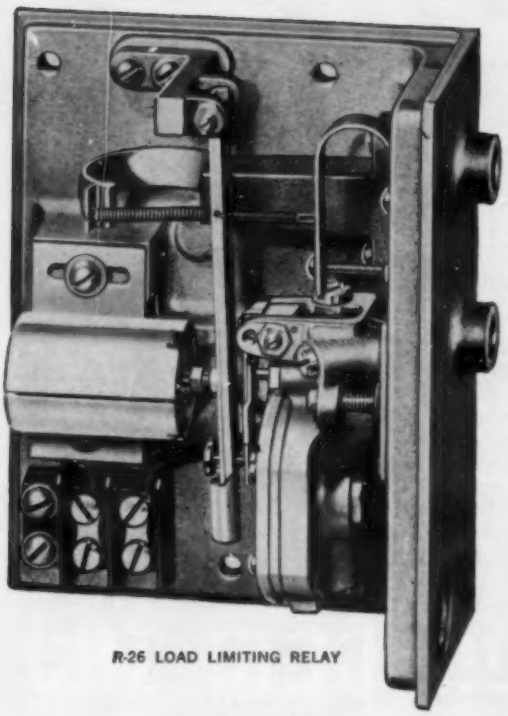


12,000 cfm, and corresponding porcelainized housings and bearing brackets can be supplied. Of lightweight construction, the wheels are said to maintain the same run-out and dynamic balance tolerances as standard wheels.

In a 1000-hr salt spray test reported by manufacturer, the epon-coated wheel shown at bottom of photo, began to rust after 24 hr, showed strong signs of rust after 168 hr, was badly rusted after 1000 hr. The galvanized surface of the wheel at right was changed to zinc chloride

NEW JOHNSON R-26 LOAD LIMITING RELAY

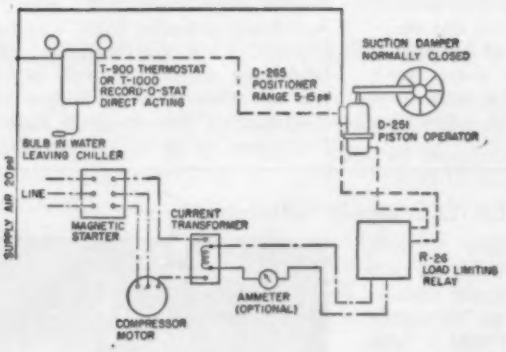
FOR POSITIVE PROTECTION AGAINST MOTOR OVERLOADING



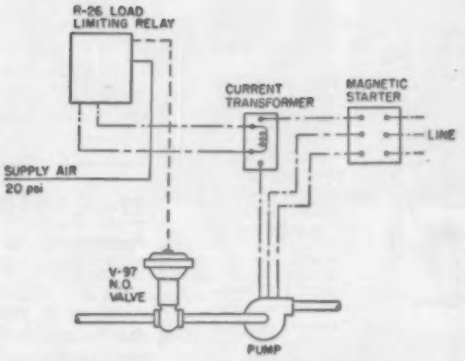
R-26 LOAD LIMITING RELAY

- A superior new limiting device for use with pneumatic control systems. Designed for application to all makes of centrifugal refrigeration compressors and to pumps, fans, and electric heating systems.
- Provides positive, efficient protection against motor overloading. Prevents failures and damage to valuable equipment.
- Operates at any current value between 3 and 7 amperes. With proper transformer, can be applied to motors of any size. Single adjustment determines maximum current input.
- Fast, highly accurate response. Pneumatic feedback element assures maximum stability and performance.
- Simple, trouble-free. No maintenance problems.

For full information, write for Bulletin R-26. Johnson Service Company, Milwaukee 1, Wis.



Load Limiting Relay used with piston operator for overload protection of centrifugal refrigeration compressor.



Load Limiting Relay applied to pump installation.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

OUR 75TH YEAR

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

For more facts circle 576 on Reply Card

. . . and for

NEARBY SERVICE on Black & Decker tools. Black & Decker maintains 50 factory service branches plus authorized service stations to give your B&D tools the attention mechanical products need periodically. Keep your B&D tools in top condition, on the job all the time.

Only factory parts and factory-approved methods are used. Fast service and reasonable cost, always.

SWIFTY SERVICE says be sure to ask about:

FREE TOOL INSPECTION no cost, no obligation.

STANDARD B&D GUARANTEE after completion of all recommended repair work.

You'll find the location of the nearest B&D repair facility in the Yellow Pages under "Tools-Electric," or write for address to: THE BLACK & DECKER MFG. CO., Dept. 0802-S, Towson 4, Md.

50th YEAR

See Tools-Electric - Yellow Pages - for Service & Sales

Black & Decker

Quality Tool Service

For more facts circle 577 on Reply Card

164

NEW PRODUCTS

(Begins on page 150)

within 24 hr. exhibited some rusting after 168 hr. After 1000 hr the zinc coating had peeled and there was a severe rust condition. The porcelainized wheel (top) showed only minor traces of rust after 1000 hr. Morrison Products, Inc.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 237-238.

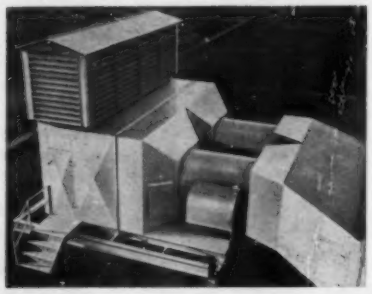
26—SEALING COMPOUNDS for construction jobs

The No. 1190 Series is a two-component family of caulking and sealing compounds. Suggested uses include serving as an adhesive to bond between new and old concrete; as a grout between concrete joints to seal out water and deicing salts; as a primer for mortar overlay on masonry buildings; to fill spalled areas to smooth to a feather edge; as a protective coating for steel, concrete and wood. It can be used as an adhesive to bond steel to steel or dissimilar materials, and for bonding most construction materials.

Characteristics announced for the seals include excellent resistance to water, water vapors, acids, oils, bases, calcium chloride solution; excellent adhesion to clean, dry surfaces; easy application by hand, putty knife, brush or trowel; and adhesive strength greater than cohesive strength of concrete in both tension and shear. Manufacturer says these compounds cure to a hard, tough mass; won't bring on aging, and are non-corrosive to metal. Presstite Div., American Marietta Co.

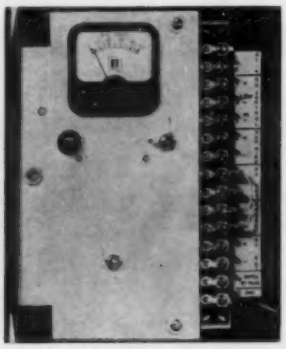
27—GAS-FIRED HEATERS supply replacement air

Announced as the largest of their kind, these direct-gas-fired package units are designed to supply replacement air in plants that are air-starved due to evacuation by exhaust systems venting fumes, gases and solid particles. Multiple installations have sufficient capacity to provide a pressure curtain at exhaust booths. Air intake is from a four-direction louver tower. Motor actuated dampers serve to seal off ceiling air intake in combustion chamber—open when gas burner ignites. Push buttons on floor level control start and stop of operating cycle —otherwise the unit operates automatically to supply 150,000 cfm of warm air. Metals Engineering and Mfg. Co., Inc.



28—MAGNETIC AMPLIFIER for proportioning control

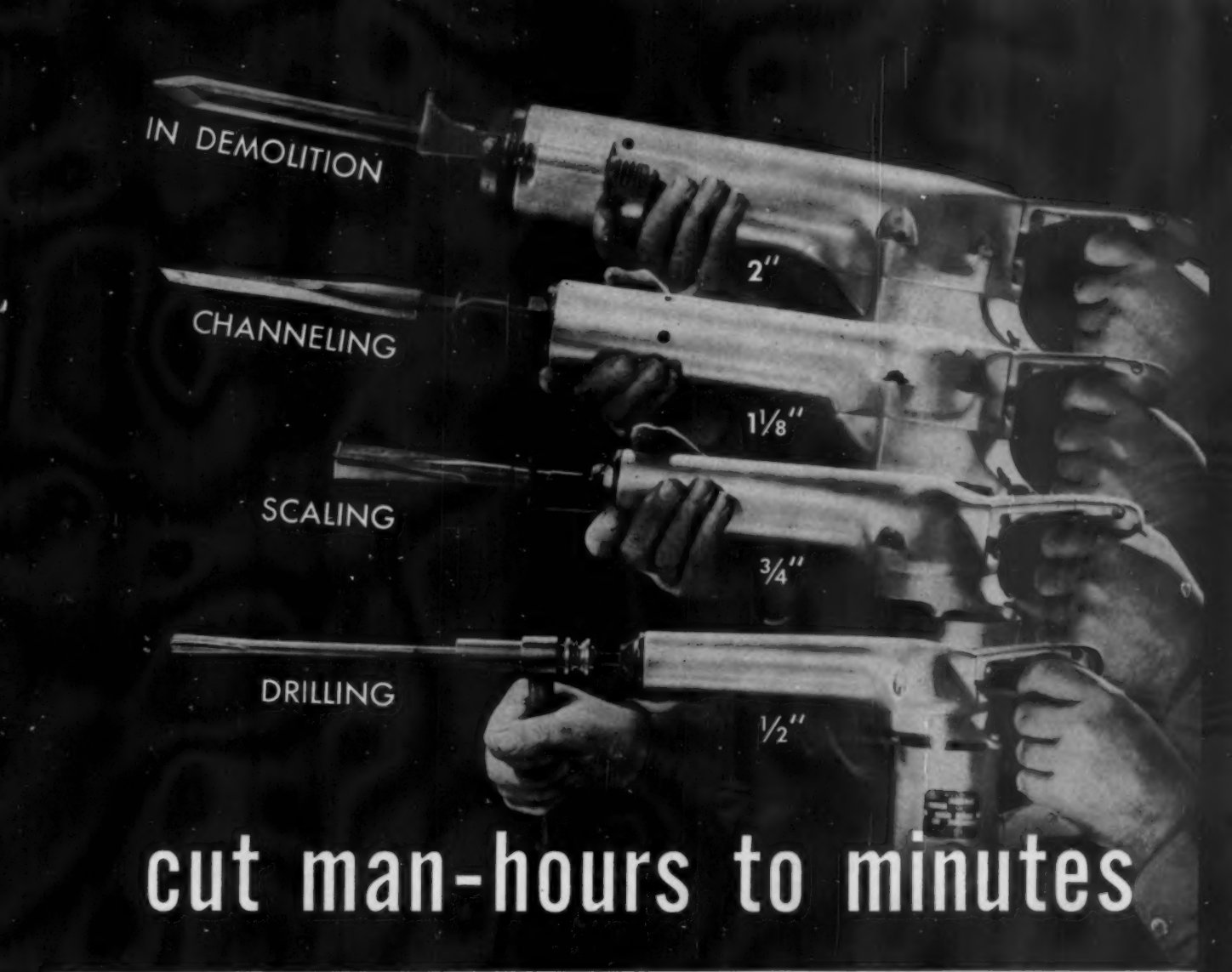
This magnetic amplifier is designed for current-proportioning control instruments in glass, ceramics and metal heat-treating operations. Device can be used with any proportioning controller having an output span between



0.3 and 20 miliamperes to provide a stepless, contractless means of electric furnace control. It is equipped with a shunt resistor so that it can be used with company's Tel-O-Set control system. Provision for an auxiliary control winding is made for introducing a secondary signal into the control loop. Circuit also has a bias adjustment so that amplifier's minimum output can be matched with minimum d-c input control signal. Minneapolis-Honeywell Regulator Co.

29—ULTRASONIC UNIT combines cleaning, degreasing

AutoSonex is an automated ultrasonic process which intergrates cleaning and degreasing with high speed production of metal parts. They enter the AutoSonex directly from automatic grinders, screw machines, and other fabricating devices, as well as from tote boxes via vibratory hopper feed. The machine incorporates a series of four rotating wheels with evenly



cut man-hours to minutes

...with Black & Decker's Electric Hammer Line

2200 cutting blows a minute . . . that's how fast a Black & Decker Electric Hammer can break up masonry, scale weld splatter, channel in concrete or drill a hole. Man-hours drop . . . output soars! Every Black & Decker Hammer is *power-packed* to dish it out . . . *ruggedly-built* to take it . . . *user-designed* for easier operation. But see for yourself. Clip and mail this coupon NOW . . . or see your nearby B&D distributor. Four models, ¼" to 2" star drill capacity.

A HAMMER FOR EVERY JOB—a size for every need—that's the B&D Electric Hammer line! Four models give you a choice of ½", ¾", 1⅛" and 2" drilling capacity in concrete. And power-packed B&D Hammers' many *patented* features put them head and shoulders above the rest.

50th YEAR

Leading Distributors Everywhere Sell

Black & Decker

QUALITY ELECTRIC TOOLS

For more facts circle 578 on Reply Card

THE BLACK & DECKER MFG. CO., Dept. 0802
Towson 4, Maryland, (In Canada: Brockville, Ont.)
☐ Please arrange a demonstration of a B&D Hammer.
☐ Please send additional information on_____

Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

☐ Drills

☐ Sanders

☐ Screguns®

☐ Bench Grinders

You find Gates Hose where anything flows. Fremont Canyon Tunnel, $14,500,000 project near Casper, Wyoming, where more than 22,000 feet

Again Coffing Brings You a New Line of Hoists

For the second time in less than a year Coffing has introduced a new hoist line to give you easy, safe, positive efficient lifting power at moderate cost.

The new RA Series Safety Pull Aluminum Ratchet and Pawl Lever Hoist is easy to operate—requires minimum handle pull—only 59 pounds for the ¾-ton model to 97 pounds for the 6-ton model. It may be operated from either side and the design prevents freezing a load. Load rotation is easy because of ball thrust bearings in the load hook assembly.

Safety has been built into the hoist. It will not ratchet under load if handle is released nor will it free chain. Controls are protected from inadvertant shifting. The bottom stop eliminates any hazard from the handle being released unintentionally and prevents handle from being moved to a position parallel to the load chain which would develop undesirable twisting action. The exclusive safety handle bends to indicated overload.

Strength without excess weight in the new hoist is achieved by a special aluminum alloy which is used in the body and handle. Long service life has been provided by the high tensile material in the chain retaining guide, heat treated load sheave and the plated, high tensile, heat treated alloy steel link chain. Maintenance is held to a minimum by the rugged construction and simplicity of design.

The new Coffing RA Series Safety Pull Aluminum Ratchet and Pawl Lever Hoist is available in six models with capacities from ¾ to 6 tons. Ask your distributor or write for Bulletin ADH-86.

COFFING HOISTS

DUFF-NORTON COMPANY

826 Walter Street • Danville, Illinois

COFFING HOISTS
Ratchet Lever • Air
Hand Chain • Electric

DUFF-NORTON

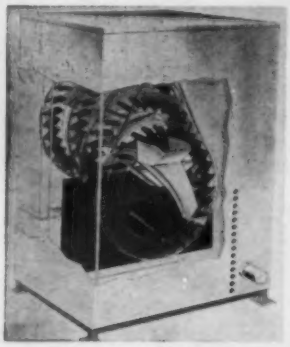
DUFF-NORTON JACKS
Ratchet • Screw
Hydraulic • Worm Gear

For more facts circle 579 on Reply Card

NEW PRODUCTS

(Begins on page 150)

spaced cubicles to hold the metal parts. As they move automatically through the series of wheels, the parts are first immersed in a degreasing



solution, powered by ultrasonics, rinsed, then drained and finally passed through an isolated solvent drying chamber before being discharged.

Manufacturer says that flexibility in selection of solvents, water solutions and even acids for cleaning and degreasing, as well as flexibility in design and size, make the electrically operated AutoSonex adaptable for practically all metal parts industrial cleaning operations. Costs are reportedly about half those for conventional methods. The machine is said to eliminate most of the need for high temperature cleaning. The standard medium size takes a floor area 28 by 42 in. Metalclean Equipment Co.

30—CONTROL DEVICE responds to input linearly

An electrical device, the Linear Positioning Motor, responds to an input with instantaneous linear movement of its shaft to any of several positions. Exact amount of shaft movement is determined and selected by simple input devices such as switches, relays, pushbuttons, contacts, or by more complex digital inputs. As input is selected the shaft of the motor moves to the proper position, uninterrupted by intermediate reference points, stops, ratches. Repeatability within 0.005 in., travel times of 100 milleseconds, and thrusts of 100 lb or more are claimed possible. The shaft of the motor is the only moving part, and it moves in a linear direction only, although the shaft is free to

For more facts circle 580 on Reply Card ⟶

You find Gates Hose where anything flows. Fremont Canyon Tunnel, $14,500,000 project near Casper, Wyoming where more than 22,000 feet of Gates Air Drill and Water Hose have been used. Workmen here are drilling prior to blasting excavation for substructure of powerhouse. Air hose is Gates 18MB Wire Braid Air Drill Hose.

Gates Air Hose delivers on the job "that couldn't be done!"

Industry everywhere uses impressive amounts of air, water, steam, suction and many other hoses in the full range of types and sizes made by Gates.

Back of the world-wide acceptance of Gates Hose is a continuing program of *specialized* hose research at the multi-million dollar Gates Research Center, staffed by more than 200 chemists, physicists and engineers.

It is the aim of this *specialized* research to increase hose utility and life . . . lower Industry's annual hose cost.

Because Gates Hose is so widely preferred, it is quickly available from leading distributors in all industrial centers in the United States and in 90 countries throughout the world . . . and its outstanding performance is guaranteed by the *World's Largest Maker of V-Belts.*

Gates 18MB Wire Braid Air Drill Hose, with oil resistant tube and abrasion resistant cover, gives exceptional performance on all heavy duty air usage under the most severe working conditions. This popular hose — one of many in Gates full line — is always available from your nearby Gates Distributor.

The Mark of *Specialized* Research

The Gates Rubber Company • Denver, Colorado

Gates Rubber of Canada Ltd., Brantford, Ontario

Gates Industrial Hose

Made in a Full Range of Types and Sizes

TPA 459

SARCO TOPICS

HOW TO SOLVE COMMON TRACER LINE PROBLEMS

How to cure water hammer with a steam trap that will operate in vertical position

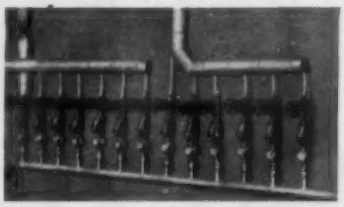
Water hammer is an inherent problem in long tracer lines. So is freezing. Both problems can be overcome, and here's an example of how it has been done. At the Socony Mobil Oil Company's Paulsboro, N. J., refinery, they found that the Sarco Thermo-Dynamic Steam Trap, type TD-50, not only withstands water hammer, but installing the trap in a vertical position —which permits free drainage—presents no problems at all, thanks to its unique thermodynamic principle. In fact, 90% of the 250 TD-50's at this plant are vertically mounted. They never block heat transfer, and they remove condensate and air as fast as they collect.

How to handle varied steam pressures — without adjustment

Can a trap — without adjustment — handle steam pressures that vary from 15 to 160 psi? Can the *same* trap vent air and drain condensate as rapidly as it is formed, be easy to install and require practically no maintenance at all? That was the problem set up by the engineering staff of Armour Chemical Division's McCook plant. They solved it by testing many traps. Their conclusion: Sarco TD-50 steam traps meet or beat their specifications, because:
they discharged condensate as fast as it formed, without wasting steam;
their compact inline construction made installation easy, even in tight quarters;
maintenance was practically negligible;
no adjustment was necessary for varying steam pressures. (In fact, the TD-50 is self-adjusting through its full operating range of 10-600 psi.)

No other steam trap can so adequately solve all these problems at one time.

How to be certain process fluid stays above 280° F. in tracer lines when outside temperature drops to −10° F.



The problem of maintaining design temperatures on tracer lines need not be difficult, no matter how extreme the conditions seem to be. For example, the tracer lines in a phthalic anhydride process at Witco Chemical Company's new Chicago plant had to be maintained above 280° F. Below this temperature, the chemical sets and the whole system would have to be taken apart and re-assembled. That's not all; ambient temperatures sometimes could drop to −10° F.

With reliability as a prime consideration, Scientific Design Company, Inc., who designed and constructed this brand new plant, selected the TD-50.

Because the TD-50 can be mounted vertically, freezing was no problem either. Added benefits that matter on tracer lines: the TD-50 is compact, light in weight, easy to install.

What is the most reliable tracer line trapping method to prevent unscheduled shutdown?

Particularly in refineries, steam traps have to function under exactly the kind of conditions that you'd expect to cause failure—they must function equally satisfactorily on low pressure or exhaust steam and on up through high-pressure, high temperature ranges. Not only that, but outside temperature may vary from subzero to subtropical. If maintaining design temperatures in your tracer lines appears to be hampered by these problems, consider how Phillips Petroleum Company, Kansas City, solved them. They found a trap which drains their tracer lines automatically over a full range of pressure, temperatures and loads. It's the Sarco TD-50 Steam Trap.

With only one moving part—a stainless steel disc, the TD-50 has little that can go wrong. In fact, it's so free of trouble that Phillips Petroleum Company consider their TD-50's as reliable and efficient as the piping. They now rely on 1800 of them throughout the plant. 1408

FOR FULL INFORMATION ON TRACER LINE TRAPPING or on any steam trapping problem—see your Sarco Sales Representative or write to

SARCO COMPANY, INC.
635 Madison Avenue,
New York 22, N. Y.
Plant: Bethlehem, Pa.

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

For more facts circle 581 on Reply Card

SARCO

Here are 7 Sound Reasons Why the Thermo-Dynamic® Does a Better Job of Trapping

1. *Simplicity*—has only one moving part. 2. *Maintenance*—practically zero. 3. *Wide pressure range*—one trap for all pressures from 10 to 600 psi. 4. *Uniform performance*—operates equally well on heavy, light, or no condensate load. 5. *Operates against back pressures*—up to 50% of inlet pressure. 6. *Rugged*—unaffected by superheat, water hammer, vibration, or corrosive condensate. 7. *Minimizes inventory* of spare parts.

Maintenance Time: 40 Seconds. If it now takes your maintenance crew more than a couple of minutes to service an ordinary trap, you're throwing away valuable time. This Sarco Thermo-Dynamic can be cleaned, blown out if necessary, and reassembled on the line in as little as 40 seconds.

For Prompt Information on the TD-50 . . . or for fast help on the efficient solution of any steam trapping problems, get in touch with a SARCO District Office, Sales Representative, or Distributor. (There's one near you.)

Only SARCO makes all 5 types:

Thermo-Dynamic* • Thermostatic • Liquid Expansion • Float Thermostatic • Inverted Bucket

*U.S. Pat. No. 2,817,353 TM Reg. U.S. Pat. Off. 1409

SARCO COMPANY, INC.
635 Madison Ave., New York 22, N. Y.

For more facts circle 581 on Reply Card

NEW PRODUCTS

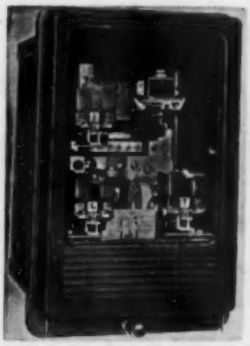
(Begins on page 150)

rotate with the attached load, if necessary.

The shaft can be attached to a load requiring only simple positioning, such as a slide switch, or to one requiring a linear positioning superimposed on an auxiliary rotary. General applications include tuning, signalling, switching, positioning. Action of motor can be compared to that of a piston, controlled by an elaborate servo system company states; however, the Linear Positioning motor does not require external error detection or simplication. It can be supplied with both coarse and fine positioning. Tronics Corp.

31—PROTECTION RELAY checks overloads

Type COM-5 Relay, designed for motor protection from very light to



heavy overloads, combines several elements to more closely match motor heating curve. From minimum pick-up to 175 per cent of tap value setting, an alarm is sounded and an operator is allowed 5 to 10 min to remove the trouble. With medium overloads, it gives normal time delay tripping protection. Provides for instantaneous tripping on heavy fault current. Westinghouse Electric Corp.

32—LUBE DISPERSION for extreme pressure use

Molykote M-55 Plus, for extreme pressure applications—on drills, taps, cold metal forming dies, punches—supersedes company's M-55, a 5 per cent EP dispersion in medium oil, and outperforms its predecessor by 116 per cent in welding load tests, 71 per cent in wear resistance tests. It is explained that Molykote M-55-Plus does not derive its extreme pressure characteristics from the fusion of additives like sulfur and chlorine at elevated temperatures, as do many EP lubricants. It is thus said to be suitable for slow moving parts under heavy loads, and for surfaces which would be reactive with additives.

Improved lubricity of M-55-Plus, and ability to "plate itself out" on metal surfaces, also suggests it for wear reduction applications in sleeve bearings and instrument gears, even though lightly loaded. A colloidal dispersion of sub-micron particles in mineral oil, M-55-Plus is approved for use in mist type lubricators, says company, and its stability recommends it as an additive in drawing oils, tapping compounds, gear oils and petroleum-base hydraulic fluids. The molybdenum disulfide particles are said to show no tendency to settle out after extended periods. The Alpha-Molykote Corp.

33—PLIERS designed to handle retaining rings

Available in 12 sizes and types, Truarc Pliers are designed to handle most commonly used sizes and types of internal and external retaining rings. They are angled to hold rings under tension and still withdraw freely. The pliers can be used for rings on shafts (external pilers) with diameters to 4 in. and in bores (internal pliers) with diameters to about 7 in. Catalog Sheet 5936 gives complete information. Proto Tool Co.

34—AIR CLEANER, high velocity, electronic unit

Up to 95 per cent efficiency while eliminating smoke, airborne dust and pollen in all types of ventilating systems is reported for the Hi-Velocity Electronic Air Cleaner. Based on principle of an "electrostatic precipitation," this cleaner charges the particles as they enter. Particles are then attracted and held by negatively charged collector plates. Both ionizing and collecting chambers are in the one, compact unit. This lightweight construction permits overhead mounting where necessary, it is pointed out, and high-voltage leads may be made from the front for convenience

Cost Conscious Companies Confirm that...

for Electrical Distribution or Test Needs

the Sensible Solution is

CUSTOM-DESIGNED *flexlab*®

EQUIPMENT by STANDARD

Realistic plant engineers recognize that, for design and construction of specialized equipment like this, it's good sense to rely on a qualified outside source.

By cooperating with a company like Standard, the harried plant engineer is freed of much troublesome detail... finds more time to turn his talents to his many other responsibilities.

Standard engineers will be glad to consult with you and offer recommendations. And whether the solution is a small power pack or a million dollar, multi-building installation, Standard has the skills, experience and facilities to design and produce—completely—the equipment to meet your requirements.

STANDARD TRADEMARK

Request Catalog No. 247 describing Standard industrial panels and consoles.

THE STANDARD ELECTRIC TIME CO.

89 LOGAN STREET • SPRINGFIELD, MASSACHUSETTS

For more facts circle 582 on Reply Card

NEW PRODUCTS

(Begins on page 150)

and safety. The cleaner comes in six models, field assembled or in cabinet form. Dollinger Corp.

35—CHARCOAL PAINT has adsorptive properties

Activated charcoal, famous for its ability to remove gases and odors from air, is now available in paint. Charcoal paint, called X-21, is made from finely powdered activated coconut shell charcoal with a binding agent. Paint can be coated on metal, concrete, stone, plastic, wood, fiber or paper surfaces. It can be used to give odor adsorptive properties to containers, rooms, buildings, fabrics, and various types of filter construction. Because it is water soluble, paint can be removed from surfaces by water scrubbing, permitting use for contamination applications where surfaces involved can be restored to original finish upon completion of treatment. Paint is black, but for other colors a white porous overcoating is available that can be tinted a pastel color. Barnebey-Cheney Co.

36—CONDENSER UNIT for rooftop blower installation

This low silhouette, air cool blower condenser is designed for use in roof-

top locations. Air movement up and out minimizes noise, says manufacturer, and the unit can be located anywhere without regard to prevailing winds. Its shape is claimed to allow for location on most roofs with a safe pounds-per-square-foot loading. Models are available in 5- to 53.5-ton capacities. Dunham-Bush, Inc.

37—WELDING ROD can join 14 different metals

This versatile nickel-silver gas welding rod, Airco 21, is said to be capable of joining 14 different metals and is designed to be used in place of many conventional bronze, steel and cast

For more facts circle 583 on Reply Card →

Hats off to the profit makers!

Maintenance departments are major profit makers. Here's why:

A 10% reduction in maintenance costs can result in a *4% jump in profits in the average plant*—according to latest Commerce Department figures.

Increasing numbers of cost-conscious maintenance men are adopting Organized Lubrication as one of the proven ways to reduce costs. As Texaco Lubrication Engineers have demonstrated time and again, an Organized Lubrication program can *cut direct maintenance costs as much as 10%!* (Other benefits: more dependable production, reduced lube inventory, simplified purchasing.)

Managers throughout the U.S. who have installed and evaluated Organized Lubrication programs can testify to the profit gained.

Texaco Lubrication Engineers can offer help and helpful material to start an Organized Lubrication program in your plant. Why don't you look into it? Call our expert—or write for a copy of our book: "Organized Lubrication . . . Major Cost Control Factor."

☆ ☆ ☆

Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. E-132.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

RESISTS CORROSION

This new super line of "Chem Marine" devices are engineered from corrosion resistant materials capable of withstanding the harmful effects of moisture, brine, grease, oils and many acids. They are designed for industrial applications such as plating rooms, shipping platforms, yards, shops, warehouses, or wherever corrosion or chemical action is a problem.

Special Materials:

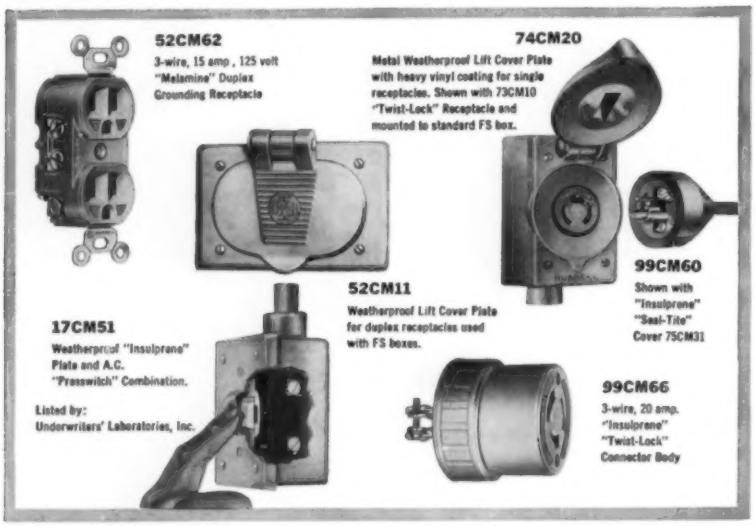
"INSULPRENE"—a Du Pont neoprene compound.

"MONEL® METAL"—Reg. Trademark of INCO.

"MELAMINE"

"CYMEL®"—Reg. Trademark of Am. Cyanamid

HEAVY NICKEL-PLATED CURRENT CARRYING PARTS.



"Chem Marine" devices are identified by their bright yellow color and a few representative items are illustrated above. For complete information contact the "Chem Marine" Department.—

HARVEY HUBBELL, INCORPORATED

BRIDGEPORT 2, CONNECTICUT, In Canada: Scarborough, Ontario

For more fac's circle 584 on Reply Card

NEW PRODUCTS

(Begins on page 150)

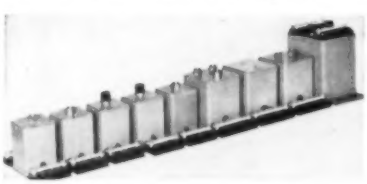
iron rods in production and maintenance torch applications where base metal may be heated to 1750 F. Metals it can be used with include mild, cold rolled, hot rolled, hot carbon, tool, cast and stainless steels, cast iron, Inconel, Monel, copper, copper nickels, bronze and malleable iron. According to company, rods can be applied in all positions without fuming or overheating the base metals. They are available in 36-in. lengths in 1/16 to 1/4 in. diam. Air Reduction Sales Co., Div. Air Reduction Co., Inc.

38—SHEET PACKING combines asbestos, Hypalon

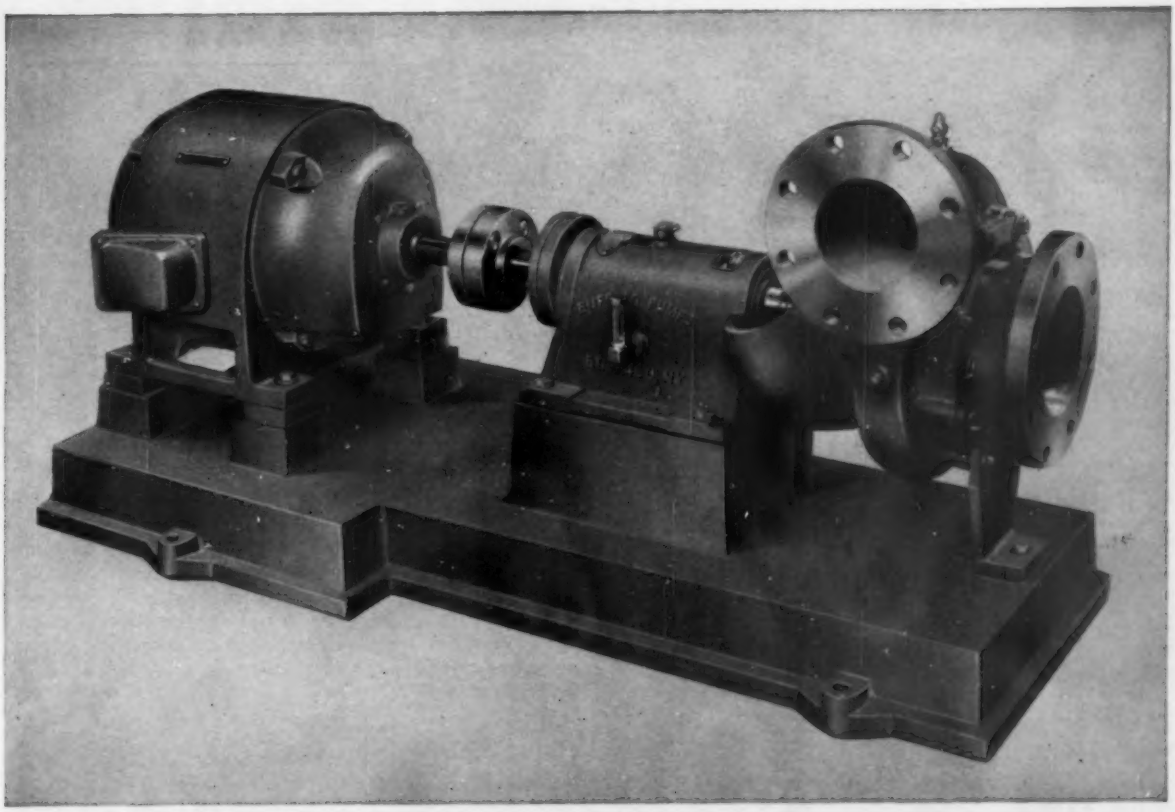
For use where chemical exposure creates problems of expense, excessive maintenance, or interruption of processing, Style 903 Packing is announced as combining the chemical, ozone and aging resistance of DuPont Hypalon with the strength, inertness and economics of asbestos. Hypalon, used as the base for the packing, shields the asbestos from chemical contact, increasing wear life. Tests are reported to show superior resistance to inorganic acids, such as sulfuric, hydrochloric, and pickling solutions, as well as to organic acids, aromatic hydrocarbons, and general alkalies.

The packing is claimed not subject to cold flow under compression, and because of the elastomeric nature of Hypalon to have good flexibility for convenience in installation. Also, it won't become brittle under exposure, company notes. Compressibility runs about 20 per cent and recovery a minimum of 40 per cent. It is designed for use as gasketing on flanges, condenser heads, columns, hand and manholes, pump casings. It comes in five thicknesses from 1/64 to ⅛ in. Keasbey and Mattison Co.

39—REGULATOR MODULES are versatile, compact



Originally developed for use on company's packaged d-c drives and mill processing line control, the mPac line encompasses 10 building block regulators. Completely static, these modules incorporate recent advances in fields of semi-conductor research and miniaturization, says manufacturer,



YOU SAVE ON MAINTENANCE 3 WAYS WITH "BUFFALO" SINGLE SUCTION PUMPS!

1. Easier Accessibility to Inner Working Parts Cuts Servicing Time:

Open design mounting bracket allows quick access to stuffing box for gland adjustment.

Renewable wearing rings protect casing from wear. Rings only (not casing) need be replaced.

2. Interchangeability of Parts Thru Standardization of Parts Further Decreases Maintenance Costs:

Lower parts inventory costs and stocks.

Simplified, less costly inventory control.

3. Rugged "Buffalo" Construction Assures Long, Dependable Life & Minimum Maintenance:

Full ball bearing construction means long bearing life.

Long **overall** life is provided by oversize shafts, bearings, stuffing boxes — heavy-duty casings, stands.

"Buffalo" Full Ball Bearing Single Suction Pumps are tops in efficiency with rock bottom maintenance costs. For the full story, call your "Buffalo" engineering representative or write for Bulletin 976-G.

Many Applications For "Buffalo" Single Suction Pumps:

- General water supply systems.
- Corrosive & non-corrosive liquids.
- Saturated liquids and refrigerants.
- Viscous fluids.

"Buffalo" PUMPS

BUFFALO PUMPS

Division of Buffalo Forge Co.

166 MORTIMER ST. BUFFALO, N. Y.

Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

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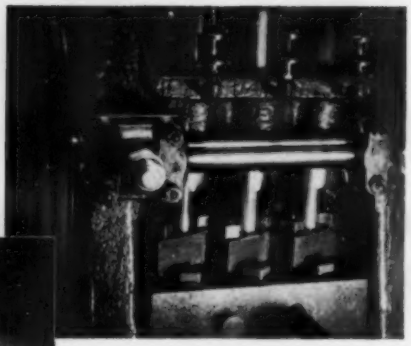
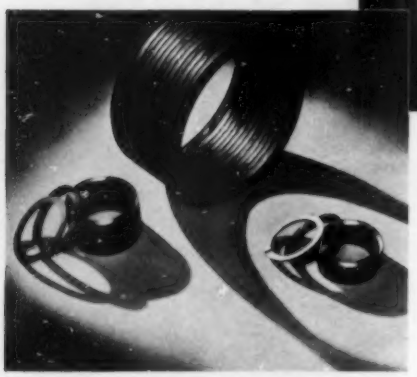
PACKINGS...
for Long-Service Savings

"LONG-LIFE"
RED SHEET

For packing flanges and other parallel surfaces in service against hot and cold water, air, saturated steam pressures up to 150 lbs., and all hydraulic applications. Pliable, strong and firm to hold required pressures.



Thicknesses: 1/32", 1/16", 3/32", 1/8", 3/16", 1/4". Max. Width: 48"



"LONG-LIFE"
MOLDED-LIP
AND O-RING
PACKINGS...

FOR AIR, GAS, OIL, CHEMICALS, STEAM, WATER, SOLVENTS

"If it's GOODALL, it MUST be Good!"

Contact Our Nearest Branch for Details and Prices

Standard of Quality—Since 1870

HOSE · BELTING · FOOTWEAR · CLOTHING
AND OTHER INDUSTRIAL RUBBER PRODUCTS

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GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

BRANCHES AND DISTRIBUTORS THROUGHOUT THE UNITED STATES.
IN CANADA: GOODALL RUBBER CO. OF CANADA LTD., TORONTO.

For more facts circle 586 on Reply Card

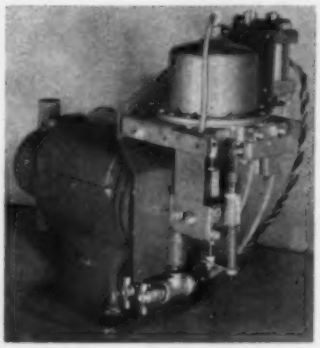
NEW PRODUCTS

(Begins on page 150)

and are ideal for control of motor or generator fields, speed regulators, current regulators, time rate or current limit control. Included among modules are adjustable time reference unit; power supply; reference regulator; 15-v comparator; 30-v comparator; power amplifier; cross-over unit; adjustable current limit unit; low level current amplifier; and 6-v bias supply. Also available are magnetic amplifier field supply panels in five current ratings at 120 or 240 v d-c to provide power linkage between modules and motor or generator field. Publication ED102 gives data. Cutler-Hammer Inc.

40—PROPORTIONING PUMP for automatic pH control

This positive displacement proportioning pump is a pneumatically-operated unit for automatic control of pH in process water. It is designed to respond to a standard pneumatic con-



trol pressure of 3 to 15 psig, and to feed chemicals in proportion to varying hydrogen ion concentration. In addition, a dual control feature enables feeder to feed chemicals in proportion to a varying flow rate. It can be set to satisfy one or both variables, with variation in pH influencing stroke length and variation in flow influencing stroking rate. B-I-F Industries, Inc.

41—ROLLER CHAIN designed to handle heavy loads

Offset Side Bar Roller Chain is described as a precision made chain tough enough to be used on heavy drives where the going is severe. The chain is made up of a series of identical links held together with cotter or riveted pins. If elongation of the chain occurs during operation, any link can be easily removed in the shortest downtime. Chain is constructed with built-in clearances so as to compensate for slight misalignment

Industry-proved through a quarter century of service... THERE'S NO DOUBT ABOUT NEOPRENE

OIL:

another ex-enemy of portable cord... thanks to neoprene jacketing

Ordinary rubber swells like an infected thumb if you let it soak in oil. *Unseen* deterioration of the rubber is even worse. Oil absorption causes progressive loss of tensile strength, elasticity, durability.

Portable cords in industrial service frequently are exposed to oil and grease. Such treatment drastically shortens effective service life... but not if cords are made with oil-resistant neoprene jackets.

Neoprene jacketing helps keep cords on the job longer ... serves as an insurance measure against costly interruptions of electrical service. Neoprene resists oils, greases, chemicals... stays tough and resilient at both high and low temperatures... shrugs off the effects of ozone and aging. No other jacketing material has such a versatile combination of properties. No other jacketing material has been so thoroughly proven in actual service. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department PE-2, Wilmington 98, Delaware.

DU PONT NEOPRENE

Better Things for Better Living ... *through Chemistry*

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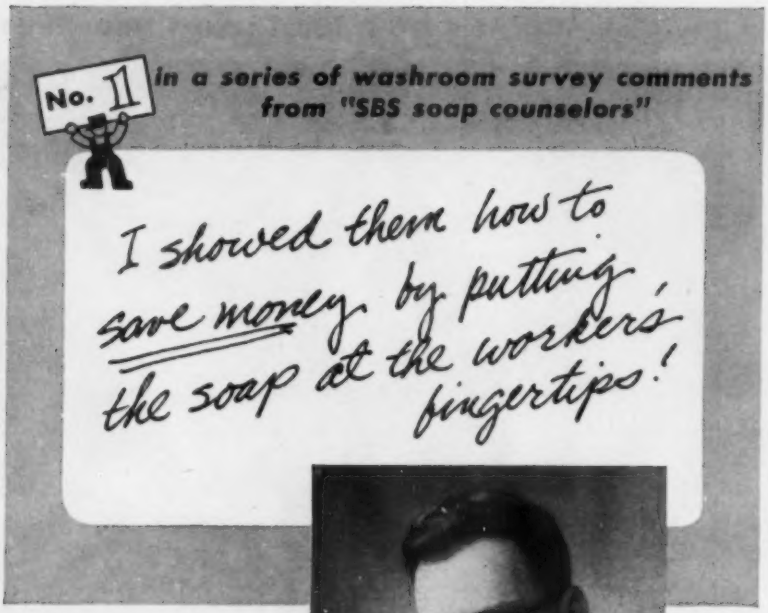

No. 1
in a series of washroom survey comments from "SBS soap counselors"
I showed them how to save money by putting the soap at the workers' fingertips!

Waring G. Houston

is the SBS soap counselor in the New England area. A specialist in industrial soaps for several years, he has helped many plants pinpoint the most effective and economical solutions to their skin cleansing problems. Here's a good example.

"After showing our presentation OPERATION PINPOINT to an eastern rubber company, I made a survey of their skin hygiene conditions and wash-up practices. They had a real (and costly) problem in removal of butyl vulcanizing cement from hands . . . especially after the cement had dried. Gloves couldn't be worn for this work and protective hand creams proved only partially effective. Consequently, workers made many extra trips to the washroom . . . and this was costing the company plenty in lost production time. I suggested that they simply *bring the soap to the workers* by using our SBS-30 Waterless Cleanser. It easily removes adhesives and tough soils, discourages the use of harmful solvents . . . eliminates all those extra, time-consuming trips to the washroom."

Money-saving suggestions like this *begin* with OPERATION PINPOINT — a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J

CANADA: Chemical By-Products, Ltd., Toronto, Ontario

For more facts circle 588 on Reply Card

NEW PRODUCTS

(Begins on page 150)

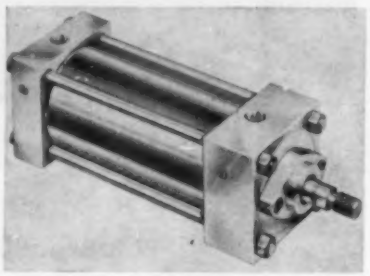
of sprockets without excessive damage. It is available in sizes to fit standard sprockets No. 100 to 180 in single and double widths. Atlas Chain & Mfg. Co.

42—ELECTRONIC CONTROL for temperatures to 600 F

Type PC Chromatrol Electronic Controller is announced as giving sensitive temperature control, within 1 deg, up to 600 F. The stainless steel sensing element is a small bullet-probe only 1 in. long, ¼ in. diam. The pre-aged thermistor probe may be located in platens, in air ducts and in immersion wells up to 100 ft away from the amplifier-relay cabinet using inexpensive light-gage twisted lead wire. Loads to 10 kw can be controlled directly without a separate magnetic contactor. The controller may be used in 120, 208 or 240 v, 60 cycles. Scale covers dual-range from 25 to 225 F or 200 to 600 F. The dial-plate control is removable from the amplifier-relay for remote location up to 30 ft away. Thus, all controls may be mounted at a single location. Edwin L. Wiegand Co.

43—CYLINDERS offer flexibility of application

The Powrmation Series of low pressure air and hydraulic cylinders come in 1½- through 7-in. bores, capacities of 250 psi air and 400 to 1000 psi hydraulic, depending on bore size. A variety of mountings, rod diameters and rod ends adapt the cylinders to most installations. Strokes can be



any practical length, and an extra long bearing available with an optional gland makes internal spacers unnecessary in many long stroke cylinders. A choice of packings meets high or low temperature requirements and special requirements of various fire resistant hydraulic fluids. Standardized boots and rod scrapers protect these cylinders in dirty or dusty installations.

For added strength, mountings are welded to the one-piece steel heads.

This is for YOU!

Shows you why Clarage's airfoil fan tops all others where it counts...on-the-job

Stable high efficiency where it counts — under actual operating conditions.

That's what you *get* (not just expect to get) with the Clarage Type AF Dynafoil Fan...perfected for mechanical draft and heavy-duty applications such as industrial processes, conduit type air conditioning, tunnel ventilation.

Contact our nearest sales engineering office or request catalog on coupon at right.

Clarage Fan Company
Kalamazoo, Michigan

Please send me Catalog 859 describing Clarage Dynafoil Fans.

Name_____

Firm_____

Address_____

City_____ State_____

For more facts circle 589 on Reply Card

Money Saver
on maintenance

Money Maker
on assembly...

Snap-on®

Electric IMPACT WRENCH

You Handle All These Jobs FASTER...EASIER

- Tighten and loosen nuts up to 90% faster than by hand
- Turn most pullers
- Drive and remove screws, lag bolts
- Remove and replace studs
- Remove carbon, scale, rust, paint
- Drill and ream holes
- Tap threads
- Many other jobs

This SNAP-ON electric impact wrench is one of the handiest tools in the shop. It works so fast and easy your men can turn out double and triple the work without even thinking about it.

There's extra safety, too, in an impact wrench. A man can get up on a ladder or work in awkward positions without fighting the side thrust of a regular electric tool. Also, on drill or other work it won't burn out if the attachment gets stuck.

The tool's one-half inch square drive takes sockets 3/8 to 1-1/16 in. — many accessory tools available. Two models — 115 volts, 220/230 volts. Tool is top quality throughout — has many construction advantages. Get full details from your SNAP-ON representative. Factory branch warehouses in principal industrial centers. Or write us.

SNAP-ON TOOLS
FOR ALL INDUSTRY
8068-B 28th Avenue • Kenosha, Wisconsin

For more facts circle 590 on Reply Card

NEW PRODUCTS

(Begins on page 150)

To guard against leakage, these cylinders incorporate a pressure safe tube seal, it is pointed out, and a check seal cushion minimizes destructive effects of heavy or high speed loads. Catalog 1000 gives full details. Hanna Engineering Works.

44—METAL WALL PANEL helps reduce noise

This acoustically-treated, prefabricated, flush-type metal wall panel is

reported particularly suitable for use as an interior dividing wall or partition in areas where noise reduction is required. It is perforated on one side, and has a sound absorbing element of Fiberglas between its two metal surfaces. The panel is made in sections 2 ft wide, in 2- or 3-in. thicknesses of galvanized or cold rolled steel, primed with baked synthetic enamel.

Panel construction consists of roll forming two sheets of metal, one perforated in two identical sections. One is reversed when the two are assembled with the sound absorbing element sandwiched between them. The two sections are locked together in another forming operation. Reinforcing is provided by steel channels welded into each end of the panel. The Building Products Div., The R. C. Mahon Co.

45—APTITUDE TEST reveals mechanical knowledge

Test 6A, a mechanical knowledge test, is reported to provide a reliable index of mechanical background and experience for use in providing information on which to base hiring, placing and promoting decisions. Developed by psychologists, this relatively short-time test can be administered with minimum supervision because directions to the testee are complete and easily understood, it is announced. Also, it is primarily designed for rapid scoring and quick, accurate interpretation within the using organization by persons not specially trained and without previous testing experience. According to company, the test cost is

POWELL HIGH PRESSURE VALVES

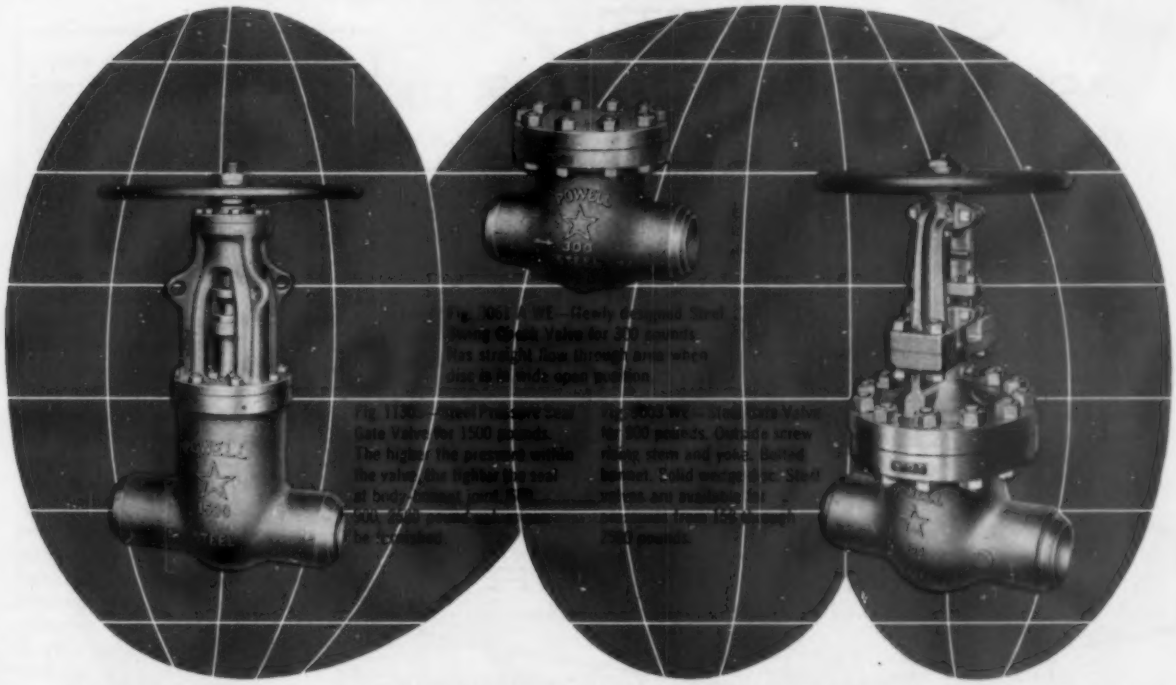
performance that makes a world of difference

Gate, Non-Return, Globe, Angle "Y", and Check Patterns—All Commercial Sizes—for—150 to 2500 Pounds and Higher; Temperatures—sub zero to 1200 F.

To handle the increasingly higher pressures and temperatures required by modern industry, Powell offers the highest quality steel valves with many exclusive Powell features of superior design and construction.

Many of these Powell Valves are stocked for quick delivery. Contact your city's Powell Valve distributor. Or write directly to us. Our engineers will quickly solve your flow control problems encountered in handling water, oil, gas, air, steam, corrosive fluids.

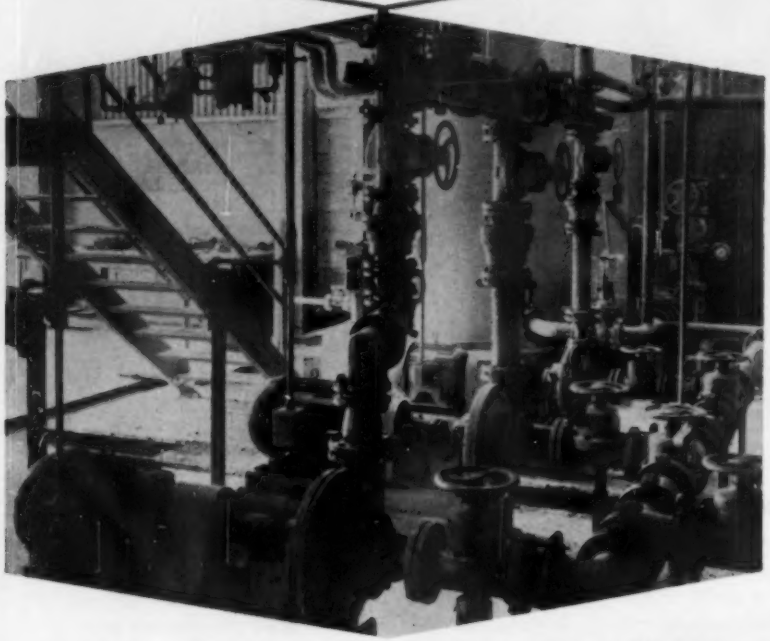
Powell . . . world's largest family of valves



THE WM. POWELL COMPANY • DEPENDABLE VALVES SINCE 1846 • CINCINNATI 22, OHIO

For more facts circle 591 on Reply Card

ONLY DORR-OLIVER MAKES
3 DIFFERENT PUMP TYPES
for complete chemical coverage



how Goodyear handles corrosive liquids with
OLIVITE
acid handling pumps

At the Goodyear synthetic rubber plant at Houston, Texas, the two Olivite pumps photographed above give excellent performance in a corrosive application. The larger 4″ pump handles 350 gpm of mother liquid containing about 4% by weight brine and .25% sulphuric acid from the shaker screen located between the rubber crumb soap conversion and reslurry tanks. The smaller 2″ pump handles 70 gpm of .5% dilute sulphuric acid. Mother liquid and acid are combined for charging to the rubber crumb coagulation tank. TDH for both pumps is 110′.

Casings and impellers of Olivite acid handling pumps are protected against corrosion by a covering of synthetic rubber. Behind them stand the specialized knowledge and experience of Dorr-Oliver—the only manufacturer offering three distinctly different pumps for complete coverage of all needs of the chemical processing industries. For complete information, write Dorr-Oliver Incorporated, Stamford, Conn.

DORR-OLIVER
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

OLIVITE—Reg. T.M. Dorr-Oliver Incorporated

For more facts circle 592 on Reply Card

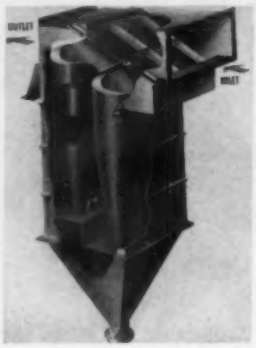
NEW PRODUCTS

(Begins on page 150)

moderate and the only expense, as scoring devices and instructions are included. Aptitests.

46—DUST COLLECTOR is economical, cyclone unit

The Dustex 1600 utilizes the same design as manufacturer's Miniature Cyclone Collector, in which the cyclone



tubes are mounted between inlet and discharge tube sheets to make possible an unobstructed inlet plenum preventing material build-up and plugging. The new model is announced as having larger diameter tubes which reduce its cost substantially while affecting its efficiency only slightly. It is suggested for product recovery and dust nuisance elimination where the ultra-high efficiencies are not required. Dustex Corp.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

47—TUBE STAPLES are made of high strength alloy

Use of a recently developed high-strength nickel silicon alloy is claimed to impart added strength to Silnic Bronze Tube Staples for supporting water tube and piping, electric cable and conduit. They are said to drive easily and never loosen; and they can be used for hanging in any position. Annular threads are designed to grip wood fibres and resist pulling out, allowing them to be driven part way in to support tube until staples can be driven home. Minimum "hammer surface" facilitates use in radiant heating systems where plaster or other finishing coats must be applied. Available to accommodate tube in four sizes, from ¼ in. nominal (⅜ in.

INVINCIBLE
Vacuum Units Reclaim . . .

bolts
broken glass
carbon black
chemicals
coal dust
coffee
cotter pins
core sand
cork
crushed stone
dirt
explosives
fabricated parts
fertilizer
flour
fly ash
fly lint
frit
gold
grains
grindings
lead
liquids
metal dusts
nuts
paper dust
plastics
powder
oils
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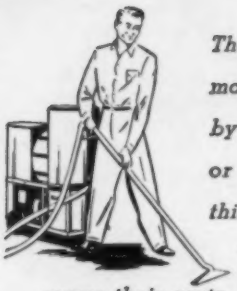
spices
starch
sugar
talc
water



These are only some of the materials successfully handled by Invincibles—by recovering or reclaiming almost anything that will pass through a vacuum hose, they quickly repay their costs . . . Invincibles also serve as vacuum cleaners, keeping plants clean, safe and more productive by removing all industrial dust and dirt . . . Over 100,000 Invincibles are in use—5,000 for over 25 years. Let Invincible engineers apply their more than 50 years of experience to your reclaiming or cleaning problem.

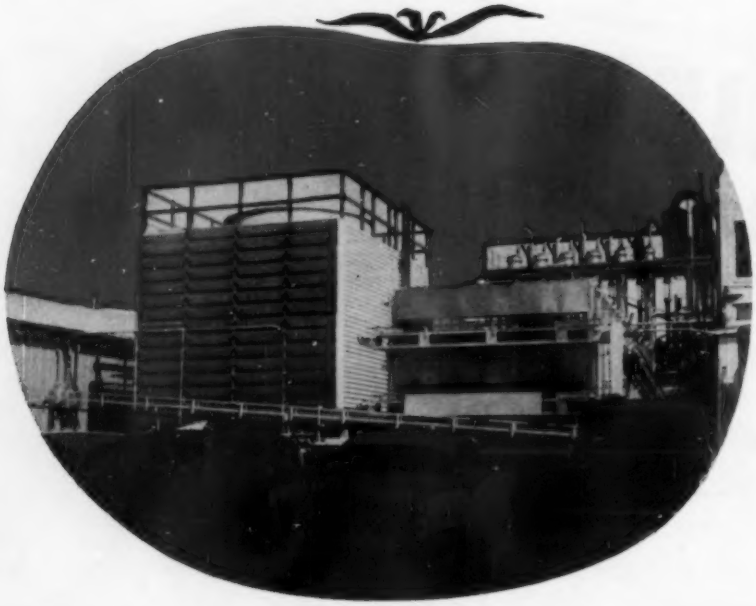
FREE BOOKLET

illustrates valuable industrial uses of Invincible Vacuum Units. *Ask for it!*

Model 809-B—an extra-heavy duty unit (5 HP). Other models from ½ to 7½ HP.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO
OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

For more facts circle 593 on Reply Card



Marley Double-Flow Aquatower®

cools a "hot tomato"

Chances are that your plant (unlike the one pictured) does *not* concentrate tomatoes, and that you do not require cooling water for an automatic can cooler. Chances are equally good, however, that your plant *does* have a "hot tomato" of some kind that could be easily cooled—at a worthwhile profit—by a Marley Double-Flow Aquatower.

Maybe it's a molding press . . . a furnace door . . . welding equipment . . . air compressors . . . refrigeration or air conditioning units . . . a process cooling requirement . . . some special seasonal demand. These are only a few of the "hot spots" alert engineers are changing to "profit spots" by conserving cooling water.

Industry's common solution to these cooling requirements is the Marley Double-Flow Aquatower. Often a single unit serves widely varied cooling requirements throughout a plant. It saves more than 95% of the cooling water that would otherwise be wasted . . . is a self-liquidating investment—and once its modest initial cost is amortized, it returns handsome dividends over its long service life.

Whether your cooling requirements are large or small, usual or individual, Marley offers a line of Double-Flow Aquatowers and smaller "packaged" towers that will handle every job dependably, economically and permanently. For information on the wide range of styles and sizes available, call your near-by Marley Engineer or write to

MARLEY **The Marley Company**

Kansas City, Missouri

For more facts circle 594 on Reply Card

NEW PRODUCTS

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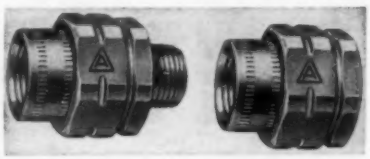
OD) through ¾ in. nominal (⅞ in. OD). Chase Brass & Copper Co.

48—LAMINATED TAPE for preparing layouts

This pressure sensitive layout tape consists of two layers of 0.0175-in. thickness each of matte acetate. Symbols are printed on the top of the bottom layer then laminated to a top layer of the same material. There is said to be no glare when used on the transparent planning boards. The Printing is protected by the overlay material, with the result that when reproduced by the diazo processes, a clearer reproduction is secured. Over 100 symbols are available. Labelon Tape Co., Inc.

49—IMPROVED UNION is small, explosion proof

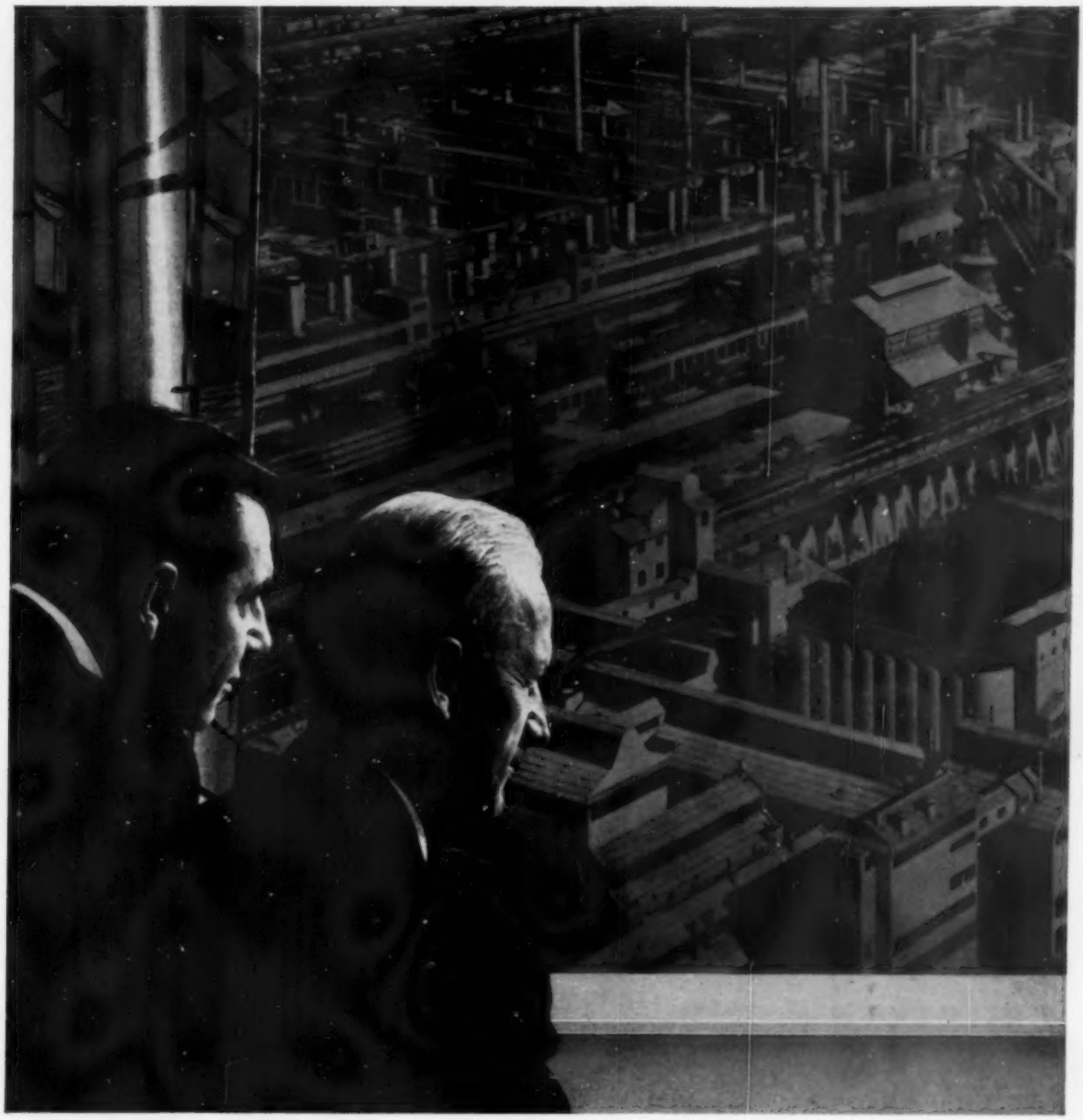
For installing rigid conduit and fittings in hazardous areas, this heavy gage, male and female explosion-proof union is only 1-9/16 in. at the widest



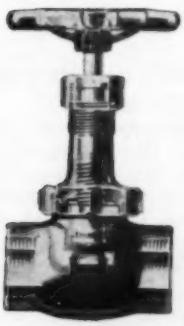
point. It is available in ½-in. size and reported to be UL approved for Class I, Groups A, B, C and D, and Class 2, Groups E, F and G locations. Appleton Electric Co.

50—TELE SYSTEM uses existing phone lines

This transistorized telemetering system transmits on-off indications from remote stations to a central location, using existing telephone lines or other audio circuits. This equipment enables operation of a remote station without personnel, as the system transmits to the central office an audio signal indicating equipment failure. Audio tones from 200 to 450 cps are



The LUNKENHEIMER Valves in your *competitor's* plant are the valves that cost *you most!*



L-460-SA

- BRONZE
- IRON
- STEEL
- PVC

With quality Lunkenheimer Valves in his plant, your competitor enjoys far fewer leakage, production and maintenance losses. Thanks to these savings, he lowers his manufacturing costs . . . and makes more profit. Why give him this important advantage? Install Lunkenheimer Valves . . . famous for quality and performance for nearly a century. The Lunkenheimer Co., Cincinnati 14, Ohio.

You can't find the cost of a valve on a price list.

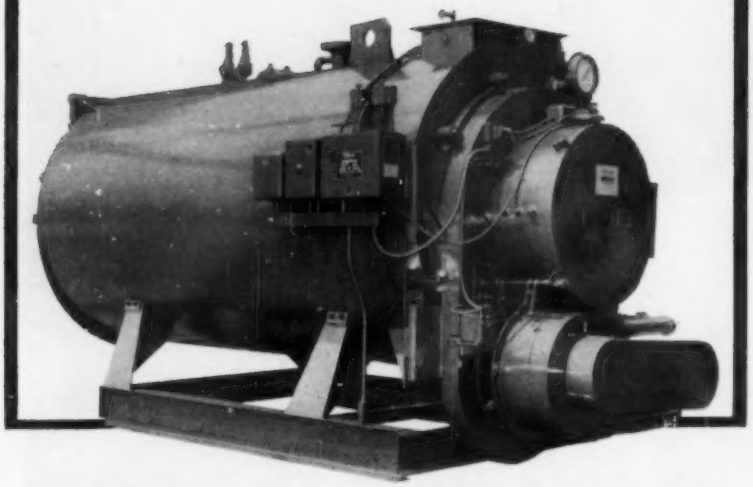
LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

For more facts circle 595 on Reply card

Continental AUTOMATIC BOILERS

2-PASS DESIGN...



WHY THIS 2-PASS AUTOMATIC BOILER CAN GIVE YOU LOWER OPERATING AND MAINTENANCE COSTS...

In the simplified, compact design of Continental 2-Pass Automatic Boilers, you get the most practical and economical approach to heat transfer available in packaged boilers today.

HERE'S JUST ONE IMPORTANT DIFFERENCE:

Continental's 2-Pass design eliminates the need for refractory baffles and brickwork. There is *no* danger of hot gases short-circuiting direct to the stack. You eliminate costly maintenance problems and your boiler operates with low stack temperature always.

The cost-saving performance of these compact boilers is today recognized by industrial concerns and institutions of all types. All the facts on the Continental are presented concisely in a new bulletin that's yours for the asking. Write today for Bulletin BE-400.

- 15 to 600 HP Steam Boilers—to 250 PSI
- Hot Water and HTW Boilers
- Oil, Gas, Combination Oil/Gas

CONTINENTAL BOILER DIVISION
BOILER ENGINEERING & SUPPLY COMPANY, INC.
Phoenixville, Pennsylvania

For more facts circle 596 on Reply Card

NEW PRODUCTS

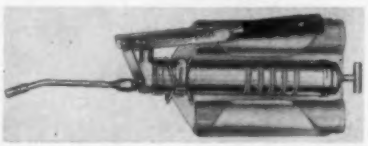
(Begins on page 150)

used. Operation may be fail-safe (where normal condition is tone presence and loss of tone indicating off-normal) or vice-versa.

The basic system uses one to 10 telemetering modulators whose tone outputs are transmitted over the telephone line to a telemetering demodulator (shown). Up to 20 modulators and two demodulators may be used on a line. Interference with normal telephone use is prevented by a band-rejection filter supplied. An interline coupling is also available. If less than 10 channel capability is required in initial installation, the basic demodulator unit can be had with components for fewer channels. System capability can be increased with additional plug-in modules. Dualex Div., Bell & Gossett Co.

51—GREASE GUN, double action, lever type

This gun is designed to provide either high pressure or volume delivery of lubricant by means of a simple shifting device. To change pressure ratios, you shift a latch pin in the handle from one slot to another. Manufacturer says that pressures to 10,000 psi can be achieved in the high pressure position, and full pressure obtained with a stroke length as small



as ¼ in. to facilitate work in close quarters. The gun has a grease-resistant rubber pistol grip and a nozzle extension that swivels 360 deg. It is of steel construction with satin finish nickel plating. Loading can be done with standard 14½-oz grease cartridge, with manufacturer's filler pump, or by suction. The gun is 20 in. long, is shown in metal holster, also available. Bulletin 230 gives details. Lincoln Engineering Co.

52—SPRAY UNIT permits central viscosity control

The Standpipe Hydra-Spray is an airless spraying unit that connects to existing circulating paint systems to permit central paint viscosity control of all spray outlets. It is claimed to eliminate virtually all over-spray and bounce-back at remote spray areas while providing uniform coverage over rough or porous surfaces, and maintaining high-speed application.

Have you ever been troubled by any of these steam trap problems?

ARMSTRONG STEAM TRAPS are designed and made to eliminate these problems

BACK PRESSURE . . . Armstrong Traps operate on any back pressure—or vacuum, for that matter. As long as there is a pressure differential across the trap, it will close on steam and open for condensate. Even the high back pressure caused by blow through of one or more traps in the system will not disturb Armstrong Traps. Other than a reduction in capacity, Armstrong Traps are unaffected by back pressure.

DIRT . . . Armstrong Traps are not affected by ordinary dirt. When the trap opens condensate swirls down under the edge of the bucket and up through the discharge orifice. Dirt is kept in suspension and discharged along with the condensate. For very bad dirt conditions, Armstrong offers traps with integral strainers. These cost less than a trap plus a separate strainer.

AIR BINDING . . . Armstrong Traps cannot air bind. Air in the system passes through a vent in the top of the bucket. It collects in the top of the trap and is discharged with the condensate. There is no chance for it to stop the trap. For low pressure on-and-off units where large amounts of air accumulate while the steam is off, Armstrong offers open float and thermostatic air vent traps in a complete range of sizes.

WIRE DRAWING . . . Armstrong Traps are designed and made to resist wire drawing. The valve and seat are tough stainless steel. The valve opens and closes tightly with a fast action and is always water sealed. There is virtually no chance for grit or sediment to lodge in the valve, virtually no chance to create conditions that lead to wire drawing.

There's no need to accept any of these problems as "inevitable." Your local Armstrong Representative can show you how to end them all. Call him today or write direct.

860 Series for low pressure heating service.

800 Series, side inlet, side outlet.

No. 801, side inlet, bottom outlet.

880 Series, integral strainer.

200 Series, bottom inlet, top outlet.

Forged Steel Series for high pressures, high temperatures.

The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

ARMSTRONG MACHINE WORKS

9125 Maple Street Three Rivers, Michigan

See Our Catalog in Sweet's Plant Engineering File

For more facts circle 597 on Reply Card

IF THERE'S A DUST HOG ON YOUR PAYROLL...

. . . let Pangborn Dust Control stop this waste!

Dust Hogs eat away profits! See for yourself—add up the cost of your lost salvageable material, housekeeping expenses, excess machine wear, intangibles such as community and employee goodwill. Whether your cost of feeding a Dust Hog is moderate or high, Pangborn Dust Control will cost you *less* than you are now paying for uncontrolled waste.

For details on Pangborn's engineering knowledge and experience, talk to the Pangborn man in your area or write PANGBORN CORPORATION, 3200 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control and Blast Cleaning Equipment—Rotoblast® Steel Shot and Grit.* ™

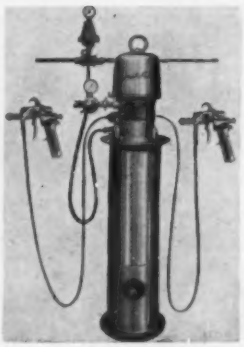
Pangborn CONTROLS DUST

For more facts circle 598 on Reply Card

NEW PRODUCTS

(Begins on page 150)

Paint is kept circulating and is drawn into the unit as it is used. The sealed standpipe lets pumping assembly



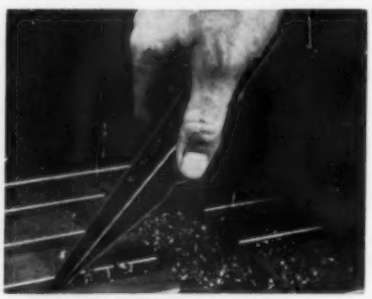
operate immersed in solvent. The unit occupies less than 1 ft of floor space. Bulletin 304-931 describes it. Gray Co., Inc.

53—SHOT-LOADED HAMMER with replaceable tip

This "no bounce" hammer has a screw-on replaceable plastic tip, and hickory handle held in place by a plastic bushing. The aluminum head has two separate cavities which are permanently loaded with loose shot; they permit handle replacement, if necessary, without loss by spillage of the shot. Metocraft Alloy & Plastic Co.

54—T-SLOT CLEANER simplifies machine cleaning

To speed cleaning of clogged T-slots, this handy tool has two working ends



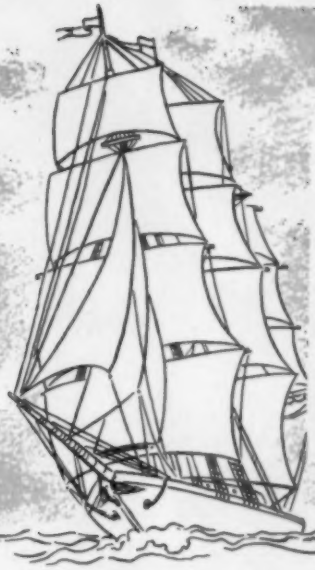
—one to rake the chips out of the slots, and the other to spoon them out of pockets at the end of the machine table. Of chrome plated or black oxide steel, the T-slot cleaners cost around $1.25 each, less by the dozen. Kelm Mfg. Co.

55—MULTI-PURPOSE OIL for gears, bearings, parts

Announced as featuring good extreme pressure qualities, penetration, com-

Why Rust-Oleum is different—

and what this difference, backed by 35 years of industry proof, means to you!



A Sea Captain developed it . . . Industry proved it!

The original Rust-Oleum formula was developed nearly fifty years ago by Sea Captain Robert Fergusson, who became intrigued with the rust-stopping qualities of fish oil early in his career. Creating a *special treatment* for the fish oil, he used the *specially-processed fish oil* as the vehicle in combination with fine rust-inhibiting pigments. The result? A coating that actually *stopped rust* when applied directly over sound rusted surfaces, after scraping and wirebrushing to remove rust scale and loose rust. Possible, because the *specially-processed* fish oil penetrated the rust to bare metal. This was the birth of Rust-Oleum's *exclusive* 769 Damp-Proof Red Primer.

PROVED THROUGHOUT INDUSTRY FOR OVER 35 YEARS

Today, Rust-Oleum in its many systems and colors, has been proved throughout industry for over thirty-five years. This proof by leading industrial users is your assurance of savings in time, money, and metal. Economies made possible by the fact that Rust-Oleum 769 Damp-Proof Red Primer goes right over the sound rusted metal—usually eliminating costly surface preparations. And Rust-Oleum, in its various systems, resists rain, sun, fumes, heat, weathering, chemicals, etc., for lasting beauty over the years.

RUST-OLEUM NEW COLOR HORIZONS SYSTEM

The Rust-Oleum New Color Horizons System introduces a new coating concept to industry. It combines four important factors: (1) the ability to stop rust, (2) smart, modern color harmony, (3) the durability to last and last, (4) ease of application that saves time, money, and metal. See how this system can bring lasting beauty to your plant, machinery, equipment, pipes, tanks, structural steel, fences, etc. Write for complete information or contact your nearby Rust-Oleum Industrial Distributor. He maintains complete stocks for prompt service.

RUST-OLEUM®

There are imitations, but only *one* Rust-Oleum. It is distinctive as your own fingerprint.

STOPS RUST!®

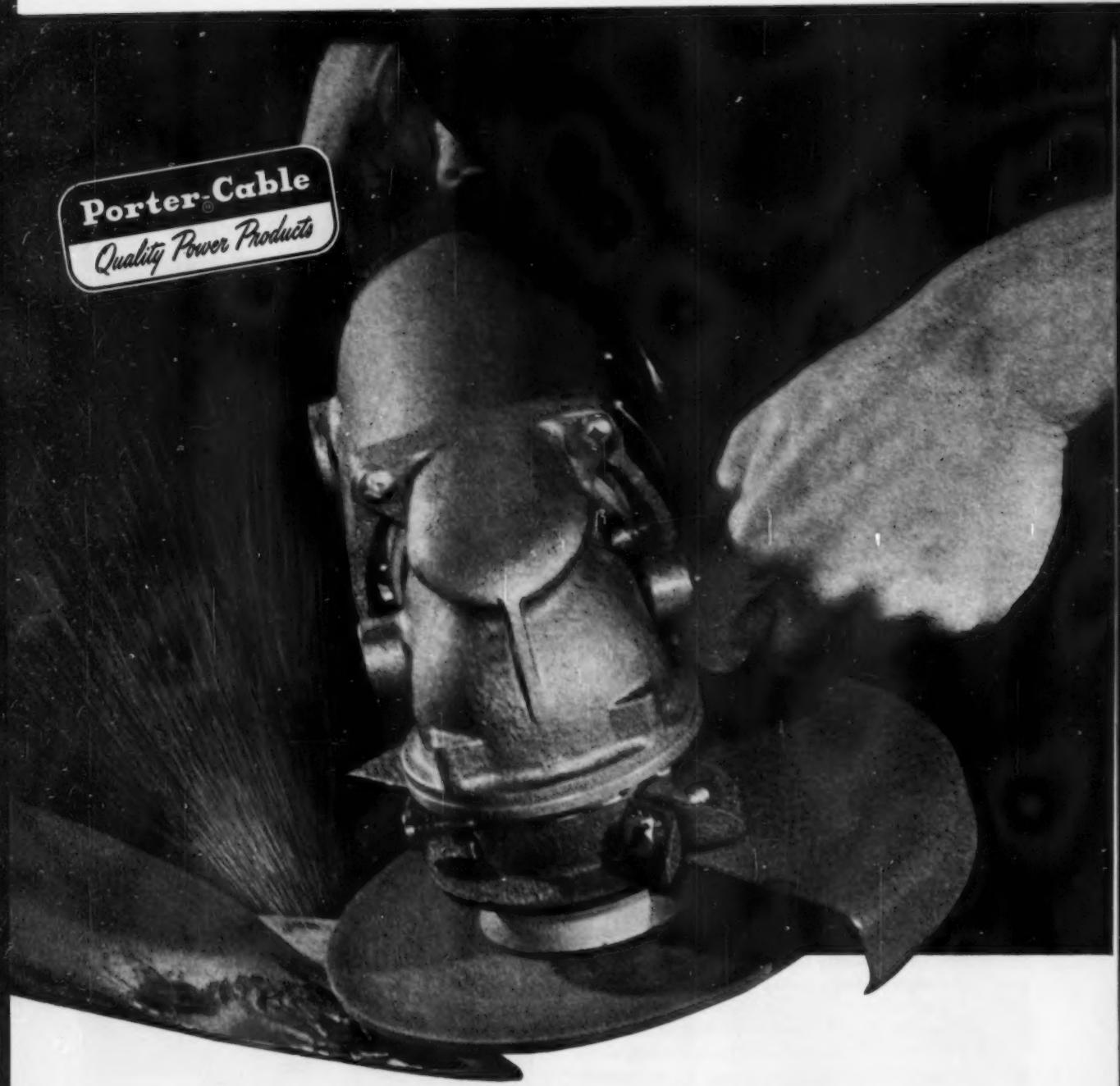
ATTACH TO YOUR LETTERHEAD

Rust-Oleum Corporation
2521 Oakton St., Evanston, Illinois

Please send me the following at no cost or obligation:

- ☐ New Color Horizons Systems Catalog featuring 110 actual color standards and 69 photo applications.
- ☐ Free test sample of Rust-Oleum 769 Damp-Proof Red Primer to be applied over sound rusted surface.
- ☐ Results of radioactive tracing study on Rust-Oleum fish oil penetration.

For more facts circle 599 on Reply Card



BUILT FOR THE TOUGH JOBS...

Porter-Cable LIGHTWEIGHT SANDER-GRINDER

This high speed sander-grinder, Model 539, is a perfect example of a power tool engineered and built to meet the exacting demands of industrial craftsmen. Its special heavy-duty motor is designed for greater efficiency and longer life. Magnesium alloy housings provide extra toughness without extra weight. Large ball bearings throughout and hardened spiral bevel gears assure smooth, trouble-free operation for a long time . . . even under the most punishing conditions.

A Porter-Cable SANDER-GRINDER increases production at reduced costs on hundreds of jobs . . . in welding shops, foundries, galvanizing plants, steel mills, machine shops, construction work. Ask your Porter-Cable dealer or write for folder.

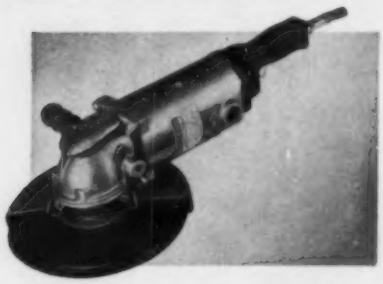
PORTER-CABLE MACHINE COMPANY

6442 Marcellus Street, Syracuse 4, N. Y.

For more facts circle 600 on Reply Card

HUNDREDS OF USES FOR THE Porter-Cable LIGHTWEIGHT INDUSTRIAL SANDER-GRINDERS

For blending and finishing steel, stainless and alloy welds . . . cleaning weld spatters . . . smoothing down rough joints and edges . . . removing rust and scale . . . finishing sheet metal jobs . . . removing ridges and imperfections on castings . . . cutting off metal piping and pieces . . . even grinding down cement seams and cleaning metal concrete forms.



Ideal for auto-body and fender repair shops. A push-button lock on the spindle makes changing discs fast and simple. Exclusive features of Model 541 include 15° forward head tilt for "natural" work angle.

Try one on the job! No charge, no obligation. Ask your Porter-Cable dealer or write direct.

Porter-Cable
Quality Power Products

Porter-Cable Machine Co.
6442 Marcellus Street
Syracuse 4, N. Y.

Please send me your free Power Tool catalog.

Name_____

Company_____

Address_____

City_____ Zone____ State____

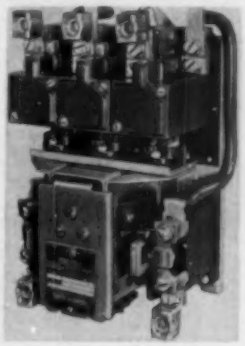
NEW PRODUCTS

(Begins on page 150)

patibility with ordinary lubricants and long life in general purpose applications, Anderol L-456 is a medium heavy diester oil with overall temperature range of 40 to 350 F. Manufacturer says it has a low evaporation rate, a viscosity index of 174, remarkable resistance to sling off, drip off and wipe off, and excellent oxidational stability. Suggested applications include sintered bearings, machine tools, gear trains, production machinery, timers, electric motors. Lehigh Chemical Co.

56—COMPACT STARTER is a third smaller in size

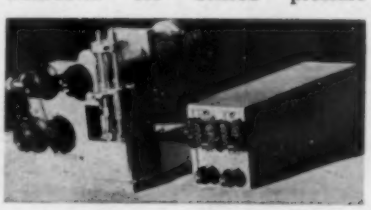
This NEMA Size 4 starter is announced as 33 per cent smaller, but retaining electrical and mechanical characteristics of company's previous design. Dimensions are 12⅜ by 8¼



by 6-5/32 in. The starter features trip-free melting alloy overload relays with unit-construction thermal units, or adjustable bimetallic overload relays with hand and automatic reset. Up to four double-circuit interlocks may be added. Molded coils plus contact blocks molded of inorganic, noncarbon tracking material are used, give extra electrical life. Square D Co.

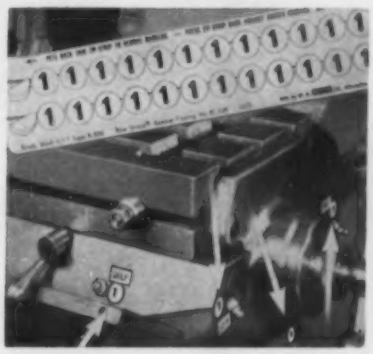
57—SERVO CONTROL VALVE designed for field use

This servo control valve is offered as a component for go-no-go check out systems. It is adaptable to situations requiring constant control of pressure at pre-determined check points. In combination with an appropriate transducer for desired pressure



ranges, plus an amplifier, this valve is said to give fast, accurate check out of pressure sensitive devices. Necessary pressure source and associated plumbing are available, to provide a complete component ready for installation. Ideal-Aerosmith, Inc.

58—MARKERS provide standard lube system



An economical method to assure regular and correct lubrication of machinery and equipment utilizes self-sticking Lube Labels to identify lubrication points, tell types of lubricant to use, and indicate frequency of lubrication. The plan can be adopted by itself, or worked into existing systems. The labels, on handy dispenser cards, are ready for application adjacent to lubrication points. You simply wipe the surface with a chlorinated cleaning solution and apply. Manufacturer says these vinyl labels may be used on flat or curved surfaces; they resist oil, grease and abrasion. They are stocked in five bright colors, which give 50 codes to identify different greases, oils and fluids. Other labels, to indicate lubrication frequency and mark lube dispensers and containers, are also available from stock. W. H. Brady Co.

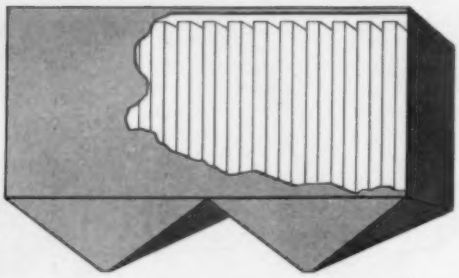
59—PENTON GATE VALVE operates at high temps

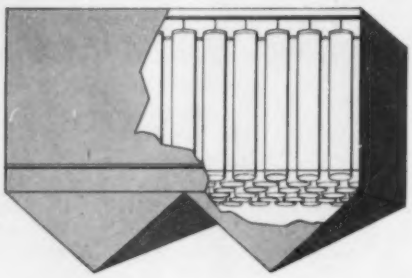
Throttlable Penton valves are introduced to meet process industry needs for plastic valves with greater chemical resistance to organic and inorganic agents at elevated temperatures. According to announcement, these valves do not lose tensile strength or hardness, are not subject to elongation at temperatures of 100 to 125 C, and are generally resistant to all inorganic acids except fuming nitric and fuming sulfuric. They are reported particularly suited for operations requiring continuous exposure to corrosive media at elevated temperatures. Design of the valve is said to offer combined features of straight-through, no-pressure-drop flow with

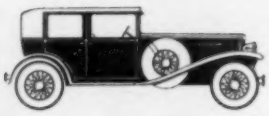
SINCE 1874 SLY

SLY DUST FILTERS
For Maximum
COMPACTNESS

1900's
SLY DUST ARRESTER
47% less filtering area per cubic foot of filter.

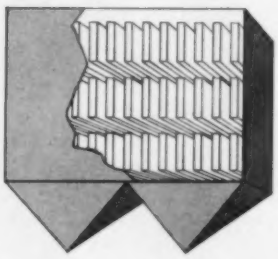






1930's
SLY TUBE-TYPE FILTER
37% less filtering area per cubic foot of filter.

TODAY
NEW SLY "ROLL-CLEAN"
DYNACLONE®
Most filtering area per cubic foot of filter.



SLY DUST FILTERS PROVIDE 20 TO 40% MORE CLOTH IN A GIVEN SPACE THAN ANY OTHER DUST FILTER.

The new "Roll-Clean" Dynaclone gives: Continuous cleaning, constant suction and complete accessibility in the least possible space.

Space saved with the Dynaclone means: Lower installation costs, lower building costs, simplified piping and ductwork.

Only the Dynaclone furnishes: A single exhaust fan that does the entire job, providing *both* suction for dust collection *and* air for bag cleaning. No auxiliary blowers required.

New "Resist-O-Wear" bags in the Dynaclone offer: 200 to 300% more bag life, easier bag changing, simplicity of construction, and *job-proved* ruggedness.

More than 40,000 Sly Dust Filters in operation, including over 1,000 Sly Dynaclones, prove their advanced design. See for yourself . . .

SEND FOR 36-PAGE CATALOG 104

THE W. W. SLY MANUFACTURING CO.

4600 Train Avenue • Cleveland 1, Ohio • Offices in Principal Cities • Overseas Licensee: Andrew Air Conditioning Ltd., London S. W. 1, England

For more facts circle 601 on Reply Card

NEW PRODUCTS

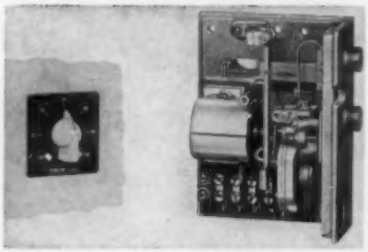
(Begins on page 150)

close throttling control. It comes in sizes from ½ to 2 in. with socket weld, flanged or screwed ends. Vanton Pump & Equipment Corp.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 237-238. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

60—LIMITING DEVICE protects against overload

The R-27 Load Limiting Relay, for use with pneumatic control systems, is intended for application to all types of centrifugal refrigeration compressures. (Other uses include pumps, fans, and electrical heating installations.) Installed in the pneumatic control circuit and responding to motor current, it serves to limit opening



of the capacity regulating inlet valves or dampers to maintain a predetermined maximum motor current regardless of the demands of other controllers. According to manufacturer, the R-27 is especially valuable in preventing damage during the "start-up" period and following prolonged or overnight shutdowns.

Highlight of this relay is a remotely located manual adjuster for limiting motor current to any selected value between 40 and 100 per cent of maximum. It thus becomes a "demand limiter" useful in reducing electric demand charges during periods of less than maximum load. Designed to operate at any current between 3 and 7 amp, when used with a suitable current transformer it can be applied to any size motor. Johnson Service Co.

61—ALARM with built-in power supply

The R2A Electronic Alarm is designed to actuate an annunciator or

new FLAKED Super Filmeen obsoletes all other filming amines

Totally effective, easiest to handle and use, most economical—this is the verdict of power engineers on the latest development from Dearborn's research laboratories—Super Filmeen in FLAKE form.

This free flowing, finely divided waxy flake is easily handled and weighed; readily dispersible... 31% more active than ordinary octadecylamine acetate... not subject to dehydration at super-heated steam temperatures... will not hydrolyze to acetic acid... remains alkaline in feed solutions.

Shipped as 100% active ingredients—saves on freight.

Update YOUR condensate return line protection with Super Filmeen. Call your Dearborn Engineer or send for detailed Technical Bulletin today!

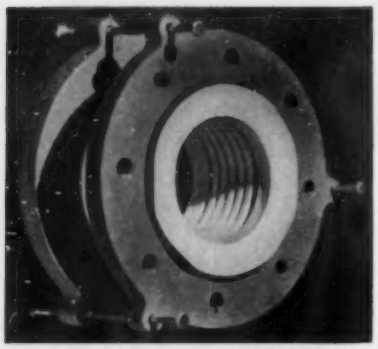
DEARBORN CHEMICAL COMPANY

Executive Offices: Merchandise Mart, Chicago 54
Plants and Laboratories: Chicago • Linden, N. J. • Los Angeles
Toronto • Honolulu • Havana • Buenos Aires

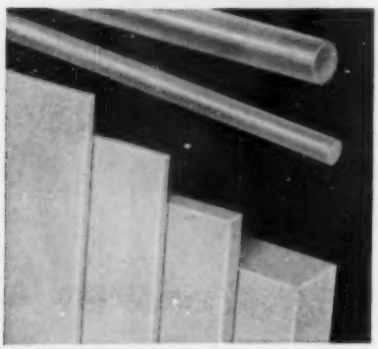
pioneer in the science of corrosion control

For more facts circle 602 on Reply Card

*du Pont Trademark



EXPANSION JOINTS • FLEXIBLE COUPLINGS



SHEETS • RODS • TAPES

Belmont Distributors in 132 key industrial areas throughout the United States can offer fast delivery of the TEFLON Products shown here because Belmont backs them with vast stocks of the most popular sizes ready for immediate shipment.

TEFLON ENVELOPE GASKETS: Round—eleven popular sizes: 1½ x 1⅞ to 8 x 11. Oval—12 x 16 x 1½. Variety of filler materials.

TEFLON EXPANSION JOINTS: Nominal pipe sizes: 1″, 2″, 2½″, 3″, 6″.

TEFLON FLEXIBLE COUPLINGS: Nominal pipe sizes: 1″, 1½″, 2″, 3″.

TEFLON SHEET: 24″ x 24″ in thicknesses 1/32″, 1/16″, 1/8″, 3/16″, 1/4″, 1/2″. 36″ x 36″ and 48″ x 48″ in thicknesses 1/16″ and 1/8″.

TEFLON TAPE: 12″ continuous width in thicknesses .010″, .020″, .030″. 24″ continuous width in thicknesses .010″, .015″, .030″, .060″.

TEFLON ROD: Lengths to 6 ft. in nominal rod sizes 3/16″ to 1/2″ in 1/16″ increments; 1/2″ to 1¼″ in 1/8″ increments; 1¼″ to 2″ in 1/4″ increments.

Ask your nearest Belmont Distributor for a complete stock list. You will find him in our insert in the Packing Section of Conover-Mast Purchasing Directory.

The Belmont Packing & Rubber Co.
Butler & Sepviva Sts., Phila. 37, Pa.

BELMONT

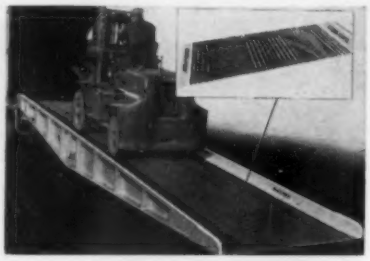
For more facts circle 603 on Reply Card

NEW PRODUCTS

(Begins on page 150)

perform an auxiliary control function when a process signal reaches a preset point. Though equipped with built-in power supply and adjustable alarm-point signal, unit can be installed with alarm-point set from a remote location. It is a null-balance device for one- or two-point alarm, operating independently of the instrument's circuit or in parallel with any of company's Autronic indicator-recorder-controller combinations. Basic components for a single alarm-point are mounted on two printed circuit cards. Each unit has slots for two sets of these, permitting both high and low limit alarms. The alarm is comprised of a plug-in case, containing the printed circuit cards, and a mounting frame. Operating from a common 0-0.5 v a-c signal, the R2A compares process signal with adjustable alarm-point signal in a different amplifier. More information is in Specification Sheet A809. Swartwout Co.

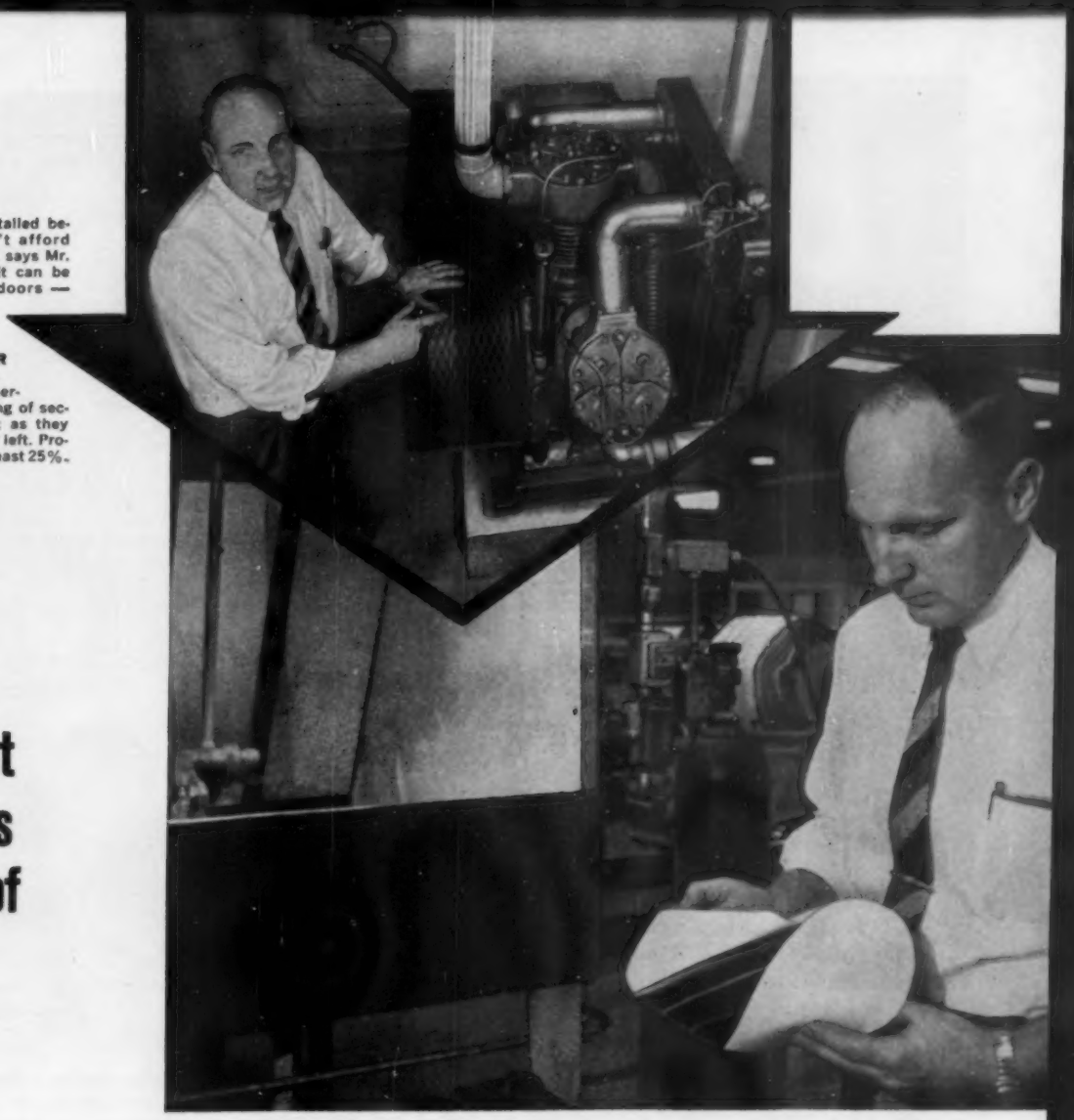
62—LOADING RAMP has an all-grating surface



Self-cleaning, this ramp has a grating surface extending from curb to curb throughout entire length of traction area. Serrated tracks are set into the grating surface to provide positive wheel traction, and are available in varying tread widths. The ramps are of lightweight magnesium for one-man handling and come in 58- and 70-in. widths, 30- and 36-ft lengths. Ramp capacities range from 7000 to 20,000 lb or more. Magline Inc.

63—AIR SANITIZER controls malodors at the source

Turgasept is introduced for use in washrooms as well as throughout plant areas in food processing and other industries where malodors are created in the manufacturing process. An added advantage announced is that the preparation also has antiseptic properties, reducing microbial population in the area treated. Turgasept does not "mask" odors or act to paralyze olfactory organs, it is explained, it works on the principle



LE ROI 50S2 was installed because Bowes couldn't afford compressor downtime, says Mr. LaFara. Air-cooled unit can be used indoors or outdoors — needs no plumbing.

FINISHED TIRE REPAIR SECTION is inspected. Compressed air now permits automatic spraying of sections with liquid latex as they pass through booth at left. Production increased at least 25%.

This plant minimizes the risk of "no air - no work" with a

LE ROI 50HP STATIONARY COMPRESSOR

A dependable compressor headed the list of critical needs when Bowes Seal Fast Corp., of Indianapolis, Ind., merged two plants under one roof. A Le Roi 50S2 two-stage compressor provides this vital dependability . . . and all the compressed air needed to produce over 2000 various items for the upkeep of cars, tires, and tubes.

James S. LaFara, Plant Manager, reports that the Le Roi unit delivers 210 cfm at 125 psi . . . operates 75% to 80% of 8- to 16-hour production days, five days a week, and supplies almost 100% of all the compressed air needed. Down-time, he adds, is at a minimum, and maintenance costs are below those of two smaller compressors which the Le Roi replaced, and which now serve only as standby units.

Look what this Le Roi 50S2 does! It provides air to spray tire-repair sections (boots) and tubeless-tire repair plugs with a mixture of liquid soap and water. The unit powers latex spraying machines, and blows scraps from tube-patch cutting machines. Other uses include air for lead moulding equipment, nut-driving units, cleaning vents on chemical filling machines, and for the plant's fire-protection system.

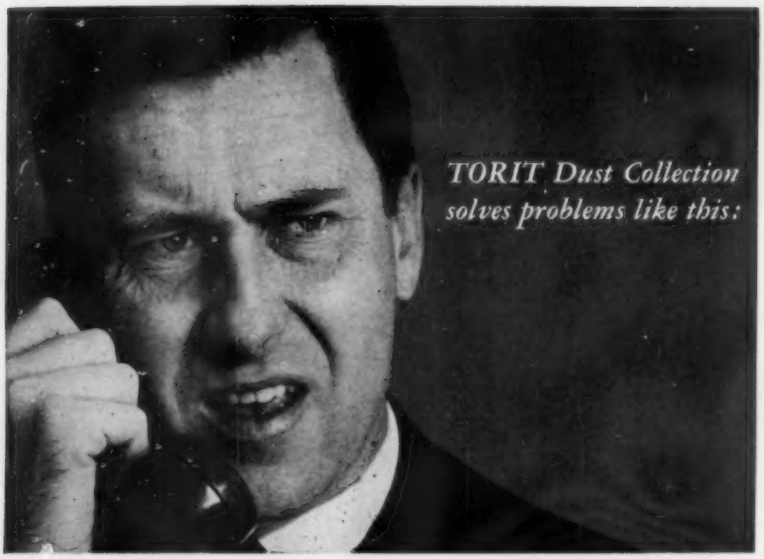
Are you looking for a "dependable" compressor? Check the complete line of Westinghouse unit-type and Le Roi stationary air compressors — from ½ to 100 hp. Contact your Le Roi distributor, or write to Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

SC-08

LE ROI STATIONARY COMPRESSORS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

For more facts circle 604 on Reply Card



"6 MEN OUT AGAIN TODAY?" "WHY?"

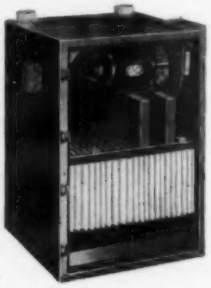
"I was on the receiving end of that question. And I knew what the boss was driving at. Production-wise, we couldn't stand our current rate of absenteeism. Even the men on the job were dragging their feet. To show you what I mean: we had just lost one of our best customers. Reason: one too many late shipments.

"Logically, when sickness strikes, you consult a doctor. Which is what I did. Without actual examinations, he couldn't diagnose the trouble. But he did give me the clue when he asked, 'How are your working conditions?'.

"Frankly, our plant is dirty. Or better put, dusty. With grinding machines running 24 hours a day, how could it be anything else? With that thought, I remembered. A salesman had been in my office just the other day talking about dust. I had too many production headaches at the time to hear him out. But I kept his card. So I called him back.

"He was from Torit. He was selling Torit Dust Collectors . . . machines that trap dust. When I compared the low cost of his equipment with the high cost of our production lag, I decided it was worth a try. So I bought one . . . just one, to start, for $285.00. We installed it ourselves on a key machine.

"The change in the man operating that machine sold me. Within a month, we had a Torit Dust Collector system attached to seventeen dust-producing machines in the plant. As a result, the air in our plant is clean, the way it should be. Our absentee rate is no longer a problem. Our production rate is at top speed. And you know something? I feel better myself!"



Is dust doing you *dirt? For complete facts on dust damage . . . and how to control it . . . write:*

TORIT manufacturing company

Dept. 1824, 1133 Rankin Street, St. Paul 16, Minnesota

For more facts circle 605 on Reply Card

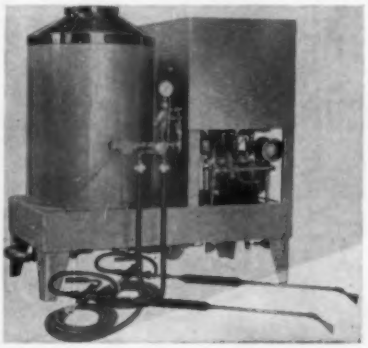
NEW PRODUCTS

(Begins on page 150)

of odor suppression—when an area is sprayed. Turgasept molecules combine with odor molecules to form odorless compounds.

The preparation contains no formalin phenolic resins or floral perfumes, company states; it does have a faint citrus fragance which becomes apparent upon use and serves to identify the space treated, but the deodorant and bactericidal activities persist long after the identifying odor is gone. It comes in aerosol spray cans or in concentrate form for dissolving in water (2 oz to the gallon). The resulting solution has low surface tension, may be used to wash down floors and walls as suplemental treatment. Turgasept Co.

64—STEAM CLEANER is gas fired, automatic



Model 330 is a fully automatic, gas-fired steam cleaner for assembly line cleaning and other work requiring large volumes of hot solution together with almost continuous stop-and-go operation. It delivers 330 gph of steam cleaning solution at 60 to 90 psi, and is available with one- or two nozzle-controlled guns, which enable cleaning operations 100 to 200 ft away from the unit. Operator controls flow of solution at gun nozzle by squeezing or releasing his grip on the handle. Where two guns are used, either is controlled independently of the other. The solution tank holds 60 gal, enough for 4 hr of steady cleaning. The burner is adaptable to natural gas, butane, propane, or manufactured gas. The compact cleaner measures 63 in. long, 36 in. wide, 62 in. high. Malsbary Mfg. Co.

65—WASH, WIPE CLOTHS are highly absorbent

Wash 'N Wipe Cloth, for washing or wiping off glass, metal, plastic, tile or ceramic surfaces, is made of non-

SYMBOL OF QUALITY

For heating or cooling liquids or gases, all B&G Heat Exchangers are built to A.S.M.E. Code requirements

B&G Heat Exchangers are not only engineered to top efficiency but are constructed to the uncompromising standards of quality and safety demanded by the A.S.M.E. Code.

With each B&G Exchanger, a Manufacturer's Data Report for Unfired Pressure Vessels, Form No. U-1, as required by the A.S.M.E. Code rules, is furnished. This form is signed by a qualified inspector, holding a National Board Commission, certifying that the construction conforms to the latest A.S.M.E. Code for unfired pressure vessels. The A.S.M.E. "U" symbol is stamped on each exchanger.

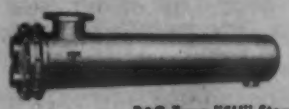
All facilities required for heat exchanger manufacture are available under one roof at B&G, where assembly line procedures permit building an inventory of stock items. Many of the machining, tooling and welding fixtures are especially designed by B&G. All welding procedures must satisfy A.S.M.E. standards...and all welding is spot X-rayed.

B&G Heat Exchangers are manufactured by methods which hold shell diameters exact and free of distortion. This permits tight fitting baffles with minimum liquid slippage and easy replacement of tube bundles if ever necessary.

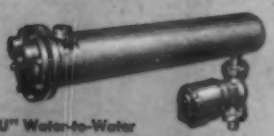
Send for free brochure, "The A.S.M.E. Story."

B&G Evaporators and Condensers

B&G Lube Oil Cooler for Diesel Engine Service



B&G Type "SU" Steam-to-Water Heat Exchanger



B&G Type "WU" Water-to-Water Heat Exchanger

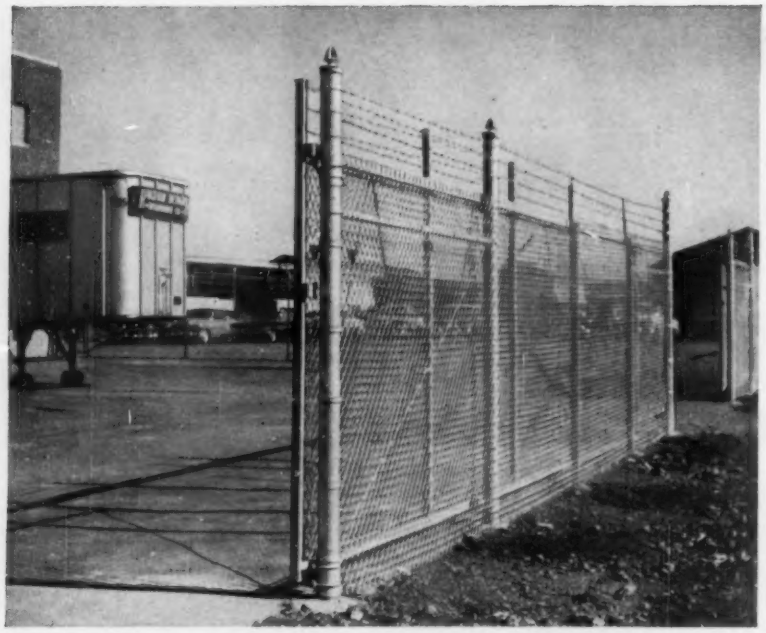
B&G Heat Exchangers are welded in specially designed fixtures by expert workmen.

BELL & GOSSETT
COMPANY

Dept. GB-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

For more facts circle 606 on Reply Card

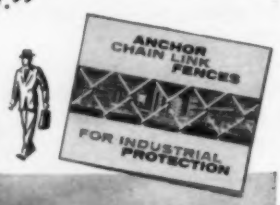


"Customers' increased confidence . . . is helping business."

HARTFORD DESPATCH & WAREHOUSE CO., INC., Cambridge, Mass.

"A new Anchor Fence really makes a difference! We have Anchor at all four of our New England branches. Customers' increased confidence in the security of our warehouse facilities is helping business. The neat appearance of the fence spruces up the property and attracts customers. We are able to store materials outside *safely*—a real saving. There has been a definite increase in safety, too. We can control traffic in and out of the plant as well as establish traffic lanes at the property."

For more information on how Anchor Fence can help *your* operation, call your local Anchor Man. Write for *free* catalogue to: ANCHOR FENCE, 6661 Eastern Ave., Baltimore 24, Md.



ANCHOR FENCE
Division of ANCHOR POST PRODUCTS, INC.

Plants in Baltimore, Md.; Houston, Texas; and Whittier, Cal. • Sold direct from factory branches in all principal cities.

For more facts circle 607 on Reply Card

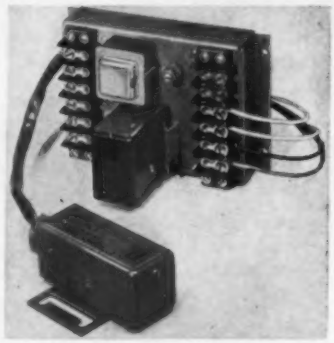
NEW PRODUCTS

(Begins on page 150)

woven cotton and rayon fibers, Described as highly moisture and water absorbent, the lint-free cloth is said to remain soft and pliable even after repeated uses, not crack, dry out or shrink, and be hand or machine washable without losing its original shape. Also, it can be used with soaps, detergents, washing powders and common cleaning agents in hot or cold water, and be sterilized. Permacel.

66—PROXIMITY SWITCH for unfavorable conditions

This proximity switch is designed for use as limit, interlock, counter or indicator sensors under such unfavorable environments as those created by oil, grits, extreme vibration, dirt or sludge. It consists of a sensor and separate transistorized amplifier with

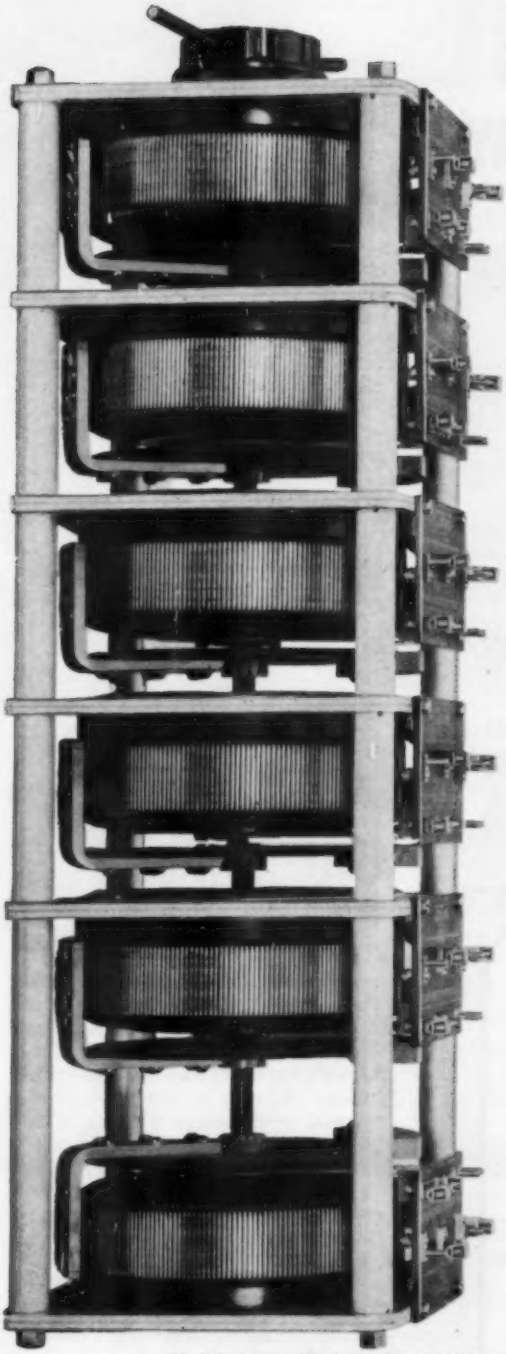


plug-in relay. The sensor detects magnetic material without physical contact and feeds an electrical output to the remotely located bi-stable amplifier, which operates the double-pole-double-throw relay wired to the circuit in the same manner as a conventional limit switch. The two components may be located up to 150 ft apart without use of shielded wire.

It is pointed out that this switch can sense products with highly polished surfaces without touching them, and that it can detect small items without retarding their flow. It can sense products ranging from automotive frames to bottle caps. The switch has an adjustable sensitivity range of ⅛ to ½ in, can be energized from 115-v, 60-cycle power. Data Sheet 163 gives more information. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

67—SAFETY PAINT features extra bright colors

Hi-Viz Industrial Paint is announced as applicable to a wide variety of surfaces with the same ease as regular colors, although four times brighter.



Six 50-ampere Variacs gang together for control of 34.5 KVA.

Variac®

Continuously Adjustable Autotransformer...

The most useful device known for the control of a-c voltage

Useful Because . . . Unlike resistive controls, Variacs are far more efficient for controlling a-c voltages — they operate on the same principle as a transformer and do not dissipate substantial amounts of power in the form of heat.

Useful Because . . . Unlike vacuum-tube and solid-state controls, Variacs have high thermal capacity and can withstand short-time overloads as much as 1000% above their ratings.

Useful Because . . . Unlike thyratrons, magnetic amplifiers, and induction regulators, Variacs do not destroy waveform purity by chopping or reshaping, nor do they adversely affect power factor.

Useful Because . . . Variacs come in many sizes . . . 2-, 5-, 10-, 20-, and 50-ampere ratings . . . 115-volt and 230-volt models . . . single or ganged . . . cased or uncased . . . manually operated or motor driven. All are backed by a two-year warranty.

Write for Complete Information

GENERAL RADIO COMPANY

Since 1915 — Manufacturers of Electronic Apparatus for Science and Industry

WEST CONCORD, MASSACHUSETTS

NEW YORK AREA: Tel. N. Y. WOrth 4-2722, N. J. WHitney 3-3140 **CHICAGO:** Tel. Village 8-9400
PHILADELPHIA: Tel. HAncock 4-7419 **WASHINGTON, D. C.:** Tel. JUniper 5-1088
SAN FRANCISCO: Tel. WHitecliff 8-8233 **LOS ANGELES 38:** Tel. HOllywood 9-6201
In **CANADA, TORONTO:** Tel. CHerry 6-2171

The Continuously Variable Autotransformer, which we named the *Variac*, was invented at General Radio in April, 1932. This invention started an industry in which General Radio continues to play a leading role.

For more facts circle 608 on Reply Card

NO DANGER
FROM ACID AND SOLVENT SPRAYS

CHEMPRO
EXTERNAL
MECHANICAL SEAL

- Installed in 20-30 minutes.
- Stuffing box pressures to 35 psi.
- No mounting gland.
- Flushing, cooling and/or lubricating can be supplied on all seals.

CHEMPRO is the only EXTERNAL mechanical seal with seal faces located *inside* the pump stuffing box. This eliminates hazardous spray conditions existing with ordinary seals whose faces are outside the stuffing box.

Unlike internal seals, the CHEMPRO is *never completely immersed in the pumping liquid.* Seal faces are adjustable EXTERNALLY by single set screw arrangement—without dismantling the seal or pulling pump shaft.

Write for Chempro Seal Bulletin CP551.

CHEMICAL & POWER PRODUCTS, INC.
The Original Fabricators of Teflon Packings and Gaskets
7 Broadway, New York 4, N. Y.

For more facts circle 609 on Reply Card

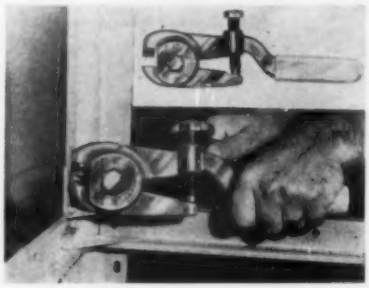
NEW PRODUCTS

(Begins on page 150)

This fluorescent paint is formulated in alkyd enamel for brush, roller or spray use; in fast-drying acrylic lacquer specifically for spraying. Only requirement is that it be applied over a white undercoat to assure full fluorescent safety action of the color selected. The paint comes in four safety colors—two for low beams, tractors, lift-trucks and industrial locomotives etc., and two for first-aid and safety equipment. HiViz is said to last indefinitely indoors, and, with a suitable protective sealer to minimize the sun's action, to give high visibility protection outdoors for 2 yr or more, depending on geographic location. Lawter Chemicals, Inc.

68—SWIVEL JAW SPLITTER cracks tough nuts easily

Stubborn "frozen" and rusty nuts can be reached, split and removed quickly, with the HKP Swivel Jaw Nut Splitter, according to manufacturer. The steel tool is designed to cut nuts



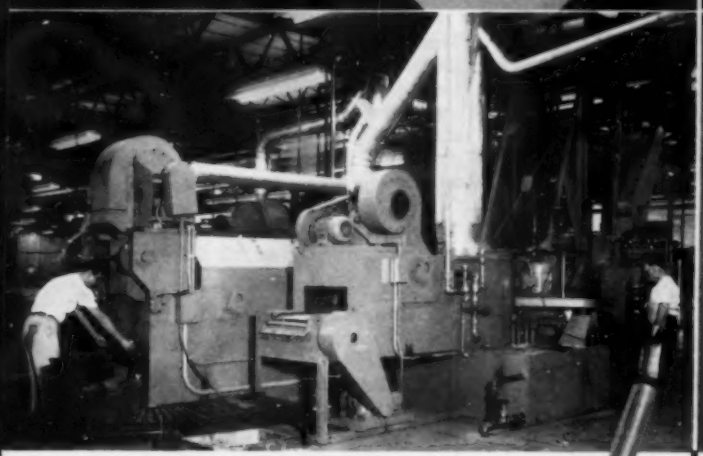
up to, and including ⅞ in. across flats. To operate, you place the swivel blade against the side of the nut, turn the power screw by hand until the jaw is tight against the nut, and then tighten it with a hand or power wrench until enough pressure is applied to split the nut. The tool won't damage the bolt from which the nut is removed, company states, and the whole procedure takes only seconds. H. K. Porter, Inc.

69—MINIATURE PICK-UPS fit in "inaccessible" spots

These miniature electronic controls are intended to permit electric eye counting and controlling units to be used in processing, printing and machine controls in areas formerly considered inaccessible. Overall size of the photo unit and light is 1-13/16 by 1-5/16 by 11/16 in. These units may be mounted on ¼-in. pipe or conduit. The units may also be mounted on a stationary support. The pick-ups may be used to detect inter-

For more facts circle 610 on Reply Card →

CALL ON **RANSOHOFF ROTO-FINISH** FOR *Engineering* FINISHING RESULTS



RANSOHOFF

ROTO FINISH

THIS AUTOMATED CLEANING AND FINISHING SYSTEM installed at Elco Tool & Screw Company, Rockford, Illinois removes wire coat from blanks; and washes, rinses, and dries 90,000 lbs. of finished nuts, screws and bolts per day. This system cleans tote pans automatically at the same time. Whether your production requirements are large or small, this is the kind of finishing *result* you can expect from Ransohoff.

A NEW VIBRATORY FINISHING MACHINE, the Vibratron, was designed by Roto-Finish to finish cast; forged and machined parts with shielded and hard-to-reach surfaces. It cleans, deburrs, descales, forms radii and fine finishes in very short time cycles. If desired, the Vibratron can be equipped to load and unload automatically.

THERE'S NO ROOM FOR GUESS WORK OR COSTLY HAND FINISHING TODAY. It's simply a matter of designing the right equipment and developing the right processing techniques for the job. Ransohoff/Roto-Finish, with a combined experience of 62 years in the finishing field know-how to solve your finishing problems quickly—efficiently—and economically.

Small wonder so many manufacturers, large and small, rely on Ransohoff/Roto-Finish to engineer finishing *results* with equipment and techniques they can depend on!

Get the Complete Story

Write for Ransohoff literature or request the Vibratron folder, today.

RANSOHOFF/ROTO-FINISH

10 NORTH FIFTH ST., AT FORD BLVD.
HAMILTON, OHIO

Specify PANNIER
STEEL STAMPS
for a longer life of
CLEANCUT MARKING

29,335 hammer blows—and still marking cleanly—Pannier Letter and Number Stamps

Rounded corners for finger comfort
Rounded head distributes impact, reduces mushrooming.
Type size identification
Added metal in Pannier fillet increases durability. Correct bevel gives clearer impression, longer life. Outside bevel longer than inside for protection of character face.

Made of the finest tool steel and correctly heat treated for best combination of hardness and toughness, Pannier single character stamps can take it! Scientific shaping and accurate engraving insure a long life of good, clear impressions. Available in letters, figures and special symbols, and in light, medium or heavy duty design.

Extra tough steel forging stamps for hot or cold, heavy duty marking

For stamping names, part or patent numbers, trade marks and similar markings, Pannier forging stamps are made in four styles:—Hand-style, fullered for wire handle and wood handle style with eye parallel or perpendicular to lettering. All are designed and heat treated for clear impressions and long service. All are covered by the Pannier Master Marker guarantee.

Supreme Holders with "Roto-Pin" for quick, easy number change

An easy, half-turn flip for Roto-Pin releases any or all of the steel type for fast change. A reverse flip locks them in perfect alignment.

Roto-Pin makes this Pannier Master Marker a time saver in number change and makes serial number marking fast and efficient. The hardened anvil at the base of the type slot keeps type in perfect alignment for equal impression. Machined from bar tool stock, the Supreme Holder has a heat treated striking head. Both anvil and striking head are replaceable for longer life of the holder itself. Made in hand or wood handle styles, for hot or cold marking.

Write for literature

BIRTHMARKED MATERIALS

MARKING DEVICES
THE PANNIER CORPORATION

501 PANNIER BUILDING PITTSBURGH 12, PA.
Offices: Los Angeles • Cleveland • Chicago • Philadelphia • Birmingham

PANNIER MASTER MARKERS FOR QUALITY

For more facts circle 611 on Reply Card

NEW PRODUCTS

(Begins on page 150)

ruption of light beam by passing box, edge of sheet etc. Reflecting type units can be used to monitor, register, differentiate between surface qualities, or establish motion limits of paper or plastic sag. Bulletin 571 gives further details. Photomation, Inc.

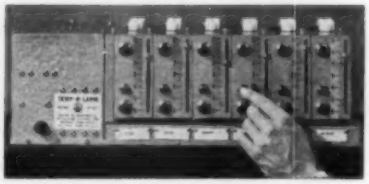
70—CLAY SEWER PIPE features improved joints

This clay sewer pipe has "Vitri-Seal" joints, a compression type seal described as self-aligning, leak-proof, resilient, acid and alkali resistant and root proof. The joint consists of polyester fixed rings in the bell and on the spigot ends, and a flexible O-ring which acts as the seal. The flexible rubber gasket is designed to maintain a tight seal all around the socket. Natco Corp.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 237-238.

71—ALARM DEVICE tells when equipment overheats

Temp-O-Larm is designed to trigger an alarm when temperatures in production equipment reach an overheat condition. The equipment comprises a thermostat pre-set to actuate at any desired temperature. When temperature in a production unit reaches this point, it sends a signal to an annunciator which causes audible and/or



visible alarms to sound locally, at a remote location by use of a telephone line, or both.

Each annunciator has an alarm time delay for setting from zero to 6 hr, to eliminate possibility of false alarms during expected and normal overheat temperatures. One of two annunciator drive units available monitors one to six production units; the other drive unit monitors seven to 12. It is pointed out that this equipment could also be used to warn of low temperatures or sound an alarm at any temperature for which a closed circuit thermostat is available. It oper-

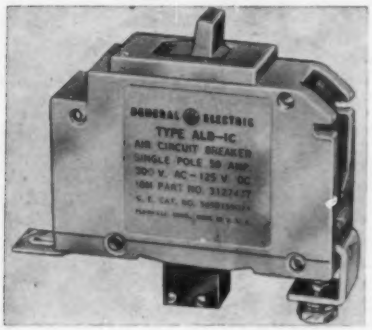
ates on 115-v, 60 cycle current with exposed connections of low voltage. Walter Kidde & Co., Inc.

72—MAGNETIC SEPARATOR for use with arc welders

This magnetic separator is announced for use with automatic and semi-automatic submerged arc welders, to improve welder performance and quality by removing from welding flux contaminating materials picked up in handling or use. The separator, a funnel used to fill the flux container of the automatic welder, contains three cylindrical Alnico magnets to remove mill scale, pieces of steel, grindings, spatter and foreign material picked up during previous use. It is designed for use with mild steel and low alloy steel fluxes. The Lincoln Electric Co.

73—CIRCUIT BREAKER for electronic applications

The ALB-1C is a low impedance, high shock circuit breaker available in ratings of 5 to 75 amp and featuring inverse time delay action. A quick-



make, quick break device, it has a thermal bi-metal and independent magnetic trip element and comes with or without auxiliary switch. Interrupting capacity is: 5-amp breaker, 1500 amp, 125 v a-c and d-c, and 800 amp, 300 v a-c; 10-to 75-amp breakers, 1500 amp, 125 v a-c and d-c, and 2500 amp, 300 v a-c. General Electric Co.

74—PRESSURE INDICATOR transmits to recorder

Model 231 Indicating Transmitter, for low-to-medium pressures, can be located to provide pressure indication at the point of measurement (or within 300 ft) on an easy-to-read dial. In addition, this unit can simultaneously transmit pressure measurement electrically to any of company's remote-located recorders or indicators. As pointed out by manufacturer, this combination provides flexibility of having pressure indication exactly at the point of measurement of the proc-

Nutting shows you "HOW"...

the widest choice of floor trucks in the world can cut your costs!

For regular or "special" design floor trucks it pays to talk to Nutting *first*. Here's why: no other company makes more models, sizes or combinations of equipment than Nutting. Many times items which you may find listed as "specials" with other makes are regular equipment in Nutting's complete line. As a result you get "custom built" trucks at production line prices. You not only get overall lower prices; you also get the benefit of 68 years of experience, design "know-how" and modern manufacturing skills. To save valuable hours of your time and get the right equipment for your plant, talk to a Nutting representative *first*, for all your floor truck needs!

Nutting makes over 1000 products, here are just 16 of them

For appliances and finished products
Wagon trucks up to 10,000 lbs. capacity
All types of dollies for boxes & cases
For sub-floor & overhead drag lines
Trailers — up to 7,000 lbs. capacity
CASTERS — all types
WHEELS — demountable rubber tired, solid rubber, plastic & metal
Shelf and tray trucks
2 wheelers for freight
Steel & aluminum frames for cases & cartons
Drag line trucks & trailers for palletless handling
Non-tilt platforms — Wood & steel frames
Shelf trucks for sub-assemblies
Dollies for cylindrical & odd shaped items
Triform & box trucks for packages & bundles
"Auto-Load" barrel & drum trucks
Tilt style platforms — Wood & steel frames

Dollar for dollar, feature for feature Nutting is your best floor truck buy. Write for your free copy of new Junior Catalog 59G.

Nutting TRUCK AND CASTER COMPANY Faribault, Minnesota

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Please send copy of Junior Catalog 59G.

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COMPANY NAME_____
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CITY_____ STATE_____

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PROTECT— AND DECORATE, TOO

With Subox—The Paint That's Different

1. Subox is the only paint in America made with suboxide of lead. Because it continues to be chemically active after drying, it gives more anti-corrosive protection — clings better to the small surfaces of fence wire. A single coat lasts many years.

2. Subox makes fence painting easy and economical. It can be brushed or sprayed on, but it is applied especially fast with a roller or an ordinary floor broom.

3. The most popular shade of Subox (Subalox 508) closely resembles weathered galvanizing. It is an ideal spot paint for all galvanized surfaces. Subox also is available in a wide range of modern pastel and dark colors.

Write today for technical literature, color card and the booklet "Simplified Fence Painting."

SUBOX PAINTS

Subox Inc.

Established 1924
19 Fairmount Plant, Hackensack, N. J.
Subox Company of Canada, Weston, Toronto 15

For more facts circle 613 on Reply Card

NEW PRODUCTS

(Begins on page 150)

ess—while being able to record and indicate that same measurement on a panel board or control center at a distant location.

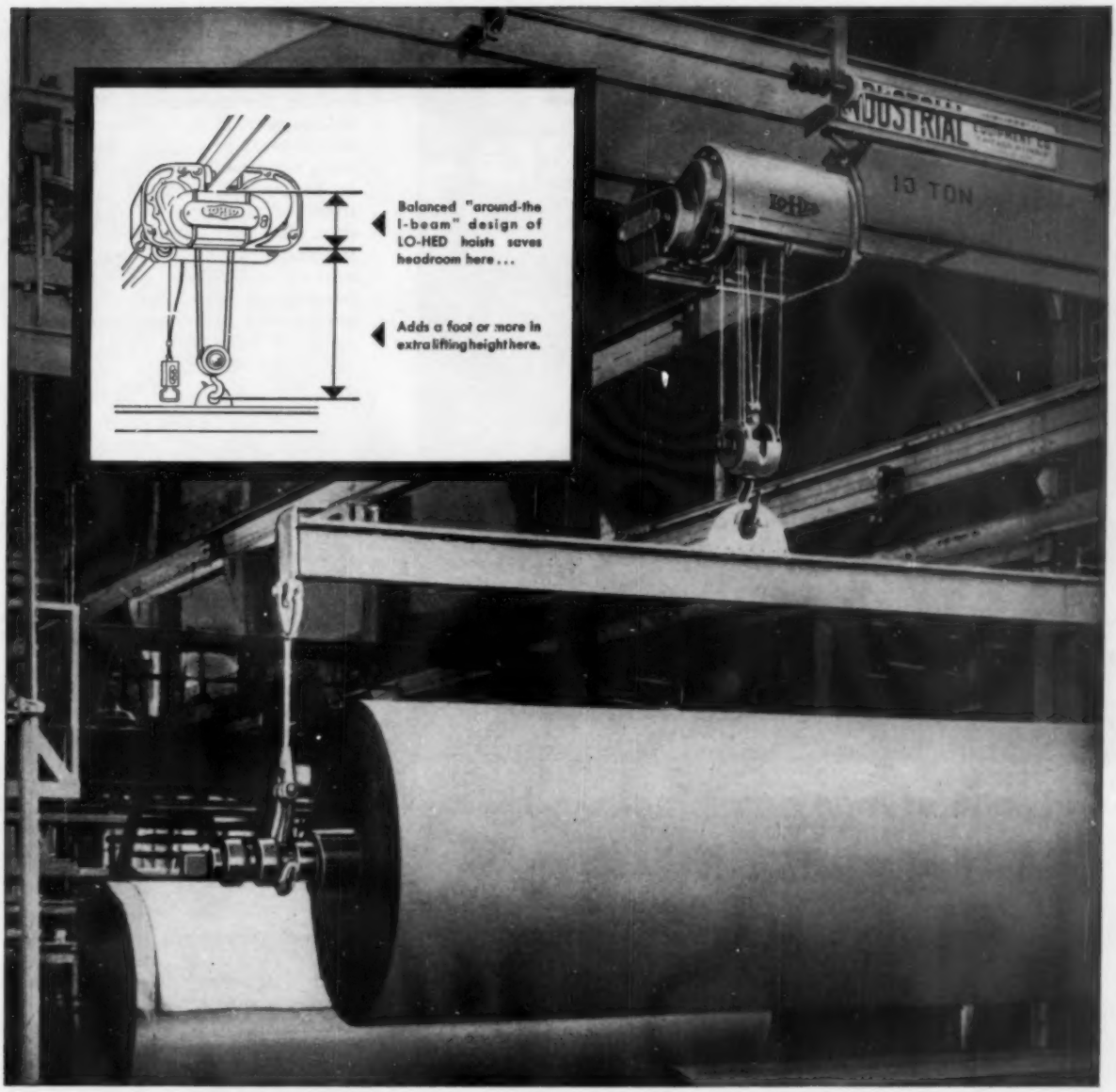
Its application in measurement of pressure (or draft), differential pressure (flow) of air or non-corrosive gases, ranges from 0-0.2 in. to 0-120 in. water, and for static pressure to 65 psig. Field conversions can be made from pressure to suction or to differential service. Only piping connections are to the transmitter itself, the only wiring connections required consisting of three-wire transmission to the remote receiver. Specifications Sheet 59-B231 gives data. The Hays Corp.

75—PULLEYS are economical variable speed units

This economical variable speed pulley is suggested for low-cost replacement on existing equipment. The series consists of five sizes ranging from fractional to 1 hp, with speed ratios to 2.8 to 1. Features announced include easy installation, adjustment over a wide range of speeds, curved pulley faces for full belt contact, high ratio for small face diameter positive lubrication and lightweight construction. Lovejoy Flexible Coupling Co.

76—MAGNETIC RACK handles all kinds of parts

Although developed for the automotive industry, the Magna-Rax, employed with overhead or monorail conveying systems, has application in handling of large or small ferrous parts, stampings etc., in dipping, spray painting, washing, coating, plating or simply conveying. Basically, it is composed of a steel frame to which are welded, as attaching members, a battery of permanent, non-electric double-ended magnets. Large units, such as a car door, or numbers of smaller pieces are loaded, held and conveyed through required operations with a minimum of surface being cov-


Balanced "around-the I-beam" design of LO-HED hoists saves headroom here...
Adds a foot or more in extra lifting height here.
INDUSTRIAL
13 TON

When headroom is critical...

LO-HED® HOISTS ADD EXTRA FEET OF LIFTING HEIGHT

When you are faced with a ceiling height that can't be changed... yet need more lifting height to solve an aerial handling problem... then check the exclusive low headroom advantages of AE LO-HED hoists. A LO-HED will give you those critical extra feet of lifting height that help clear obstructions that couldn't be cleared before ... move materials where they couldn't be moved before. When you install a LO-HED, it is like adding a foot or more to the height of your plant. Or, if you are putting up a plant addition, you can save a foot or more in building height and have the same ability to move materials. In terms of brick, mortar and steel, this can mean savings of many times the cost of your hoist investment.

And thats not all. LO-HED hoists are the "heavies" of the heavy duty hoists. They will outperform any heavy duty hoist you have ever used... regardless of performance requirements.

To see how a LO-HED can solve your headroom problems, write for our new catalog H-59, or see condensed catalog data in Sweets Plant Engineering File 1a/Ae. AMERICAN ENGINEERING COMPANY, Dept. H-164, Philadelphia 37, Pennsylvania.

AMERICAN ENGINEERING COMPANY

Hele-Shaw and Hydramite Pumps • Lo-Hed Hoists • Vibra-Grate, Perfect Spread and Taylor Stokers

AE Marine Deck Auxiliaries.

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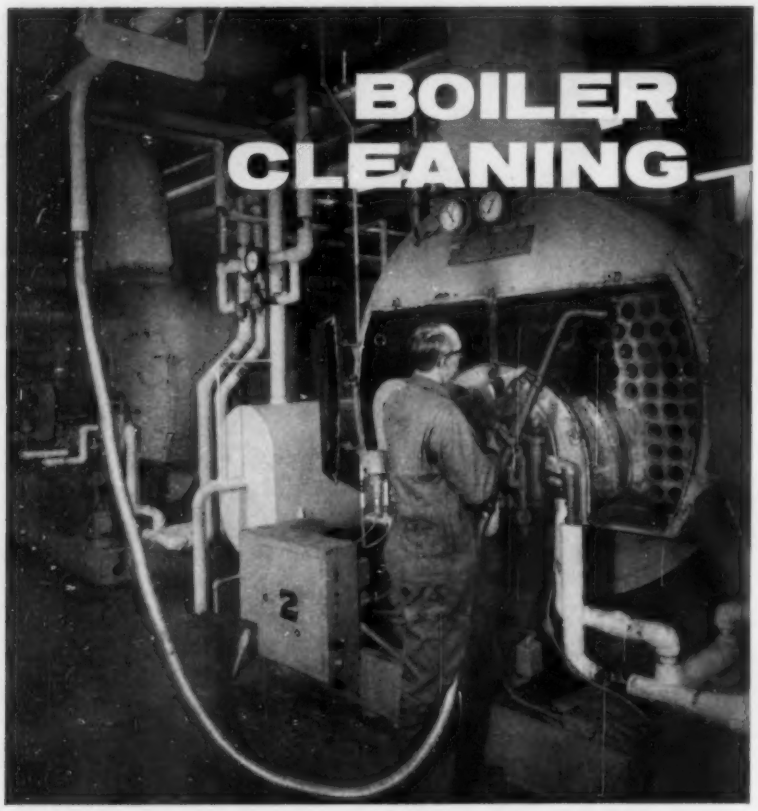


. . . one of many maintenance tasks

simplified by **SPENCER VACUUM**

Here's boiler cleaning that's *quick . . . clean . . . effective.* No time-consuming, backbreaking brushing. High velocity *air* does the work.

A Spencer vacuum cleaning system offers many advantages:

- Boilers can be cleaned HOT.
- Tubes are easily cleaned even in *cramped quarters.*
- Scale formation is reduced.
- Fuel savings are substantial.
- Requires an average of only 30 minutes.
- Bases of stacks and breechings can also be cleaned.

And boiler cleaning is just one of *many* plant maintenance and production tasks made easier with a Spencer vacuum system. Other applications include: routine cleaning . . . water pick-up . . . cleaning of small parts during inspection or assembly . . . reclaiming powders, grinding compound, etc.

Request Bulletins No. 137A (Boiler Cleaning) and No. 155C (Industrial Vacuum).

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For more facts circle 615 on Reply Card

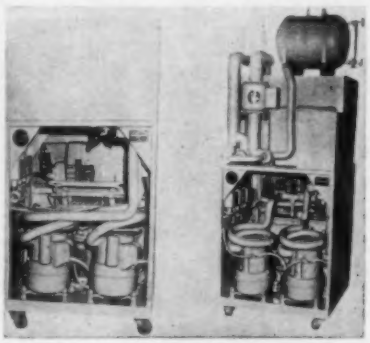
NEW PRODUCTS

(Begins on page 150)

ered by the cadmium-plated tips of the magnets. It is noted that model change-overs or parts redesigned normally require little or no modifiication in Magna-Rax, which adapt themselves to a variety of shapes and sizes. By use of auxiliary ferrous hangers, held by the magnets, all sorts of small objects, ferrous or nonferrous, may be handled. Magna-Rax are reported to tolerate temperatures to 750 F. Eriez Mfg. Co.

77—PACKAGED CHILLERS carry cold to the job

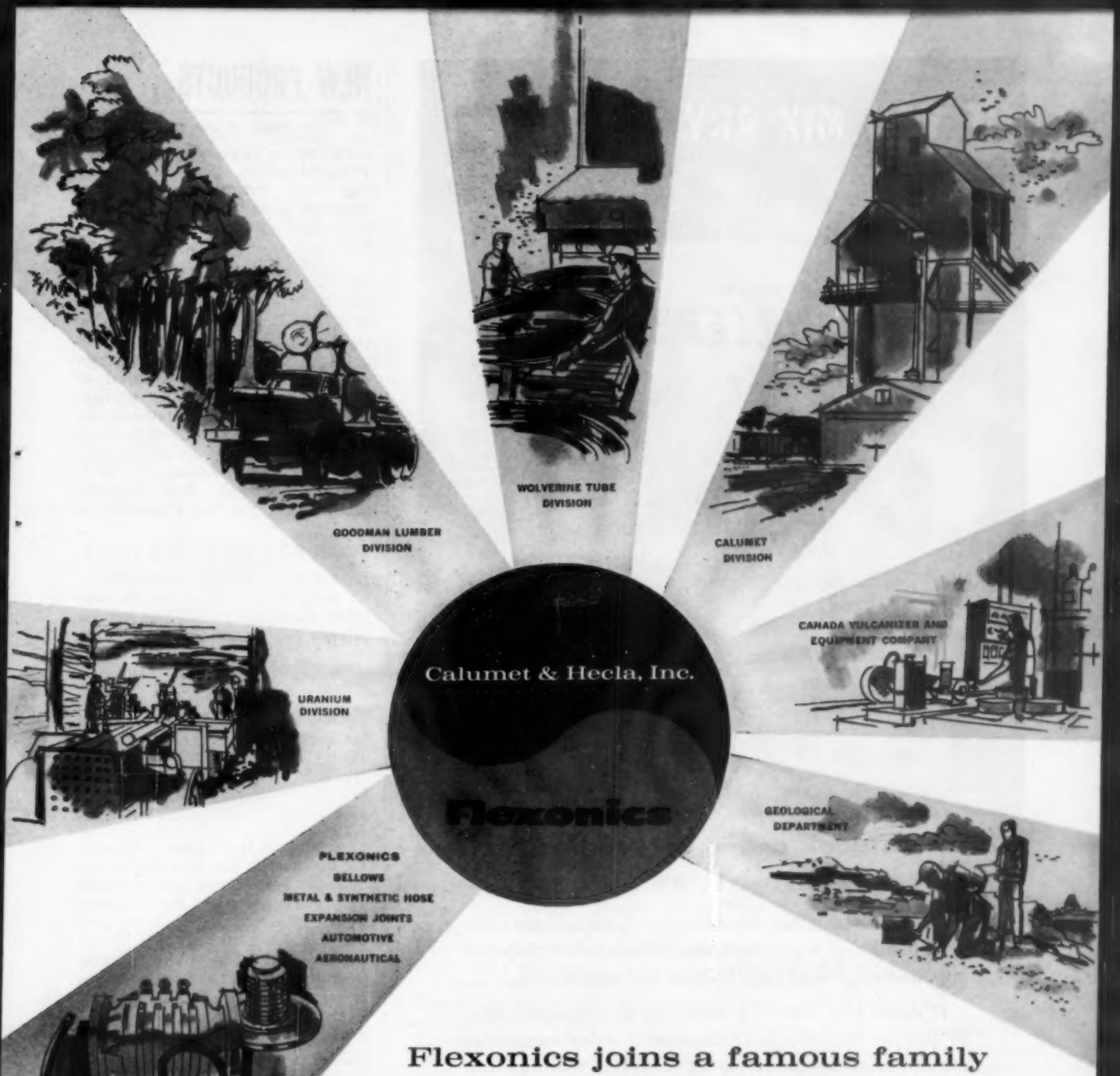
Portable, packaged, remote supplies of temperatures down to —120 F are said to be provided with Kold-Pak, a one-piece mechanical refrigeration assembly designed to provide low temperature mediums to any enclosure through heat exchangers that can be



connected to required flow lines. Kold-Paks are either direct-expansion type, with Freon refrigerants passing through a user's heat exchanger, or brine-chiller type with liquid acting as a secondary cooling agent. Twelve standard models have these capacity spans: At —40 F brine temperature or —60F evaporator temperature, capacity is 3240 to 34,000 Btu/hr. At —100 F brine temperature or —120 F evaporator temperature, capacity is 660 to 7000 Btu/hr. The unit is mounted on casters. Tenney Engineering, Inc.

78—FLOCCULANT for treating potable water

For use in the treatment of potable water, Purifloc N17 is described as a synthetic, high molecular weight flocculant with high activity for many types of suspended solids normally found in natural waters and produced by chemical treatment. According to manufacturer, it has application in treatment and purification systems to produce a better quality water at lower cost. Suggested applications in-



Flexonics joins a famous family

. . . to bring you better products and services

Flexonics Corporation's new affiliation with Calumet & Hecla, Inc., marks another important forward step.

Over its fifty-year history, Flexonics has become a major factor in the precision forming of thin metals—in the manufacture of metal hose, metallic bellows, expansion joints, hydraulic hose assemblies, automotive parts, aircraft and missile ducting systems—virtually everything for combined motion and fluid flow.

Calumet & Hecla now brings its broad industrial base to Flexonics technology. To industry, this means that new research and development facilities, new production capabilities, will soon be bringing you even better Flexonics products, an even wider range of Flexonics services.

The entire Flexonics organization is looking forward to serving you better . . . in more ways.

Flexonics corporation
1340 South Third Avenue, Maywood, Illinois
a subsidiary of **Calumet & Hecla, Inc.**

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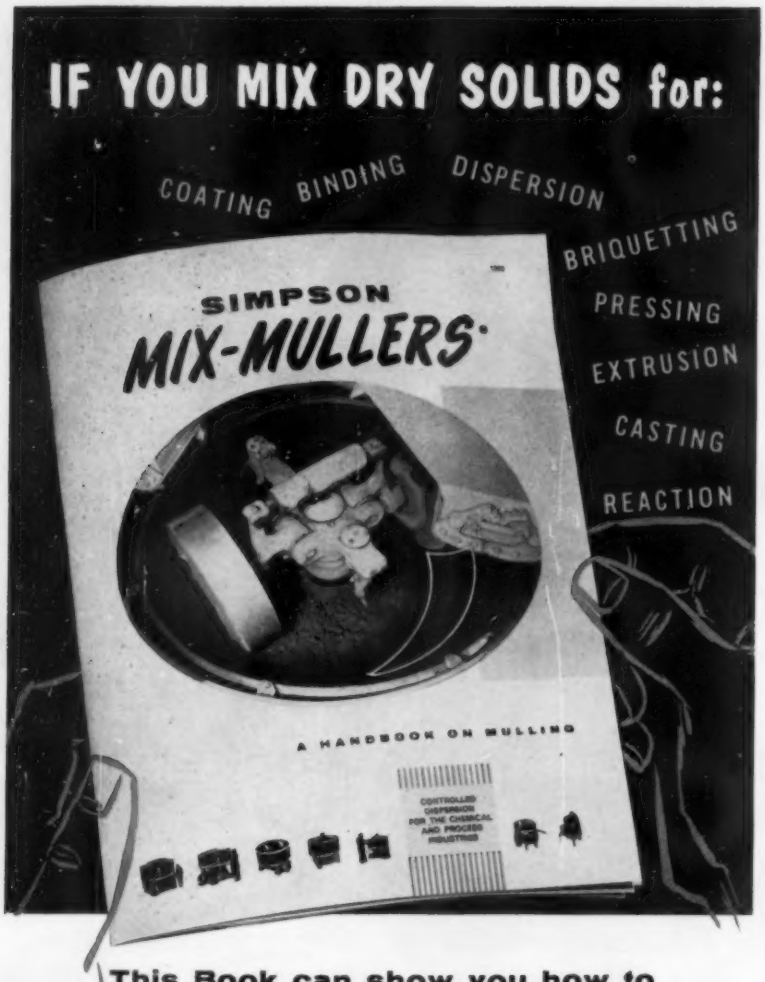


This Book can show you how to save expensive raw materials

If you're coating a fine, dry material, blending liquids into a dry powder, or dispersing a small amount of one material into another, this 12-page bulletin will interest you.

It shows how *controlled dispersion* in a Simpson Mix-Muller can help you make the *most* of today's expensive raw materials by providing an intensive, thorough and homogenous mix that *stays* mixed.

If you're caught in the bind between high material costs, high yield and stringent quality control standards—take a yardstick to *controlled dispersion* . . . write today.

MIXING IS OUR BUSINESS—OUR ONLY BUSINESS

SIMPSON MIX-MULLER® DIVISION
NATIONAL ENGINEERING COMPANY
604 Machinery Hall Bldg. • Chicago 6, Illinois
P260

For more facts circle 617 on Reply Card

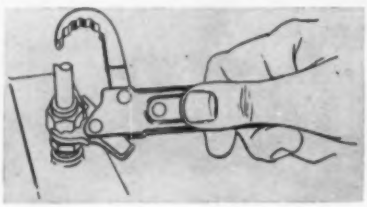
NEW PRODUCTS

(Begins on page 150)

clude use as primary coagulant for presedimentation, conventional and high rate (sludge-blanket) water treatment plants; as a coagulant aid to enhance activity of primary flocculants such as alum and ferric sulfate; as a coagulant or coagulant aid in chemical water softening to reduce the load of suspended solids to filters; as a clarification aid to design of rapid sand filters to operate at double or triple conventional hydraulic rates and yet produce water of equal or better quality. Due to high activity, only small quantities are required for a high degree of particle agglomeration, it is claimed, with a concentration of 1 ppm recommended as a practical maximum., Dow Industrial Service, Div., The Dow Chemical Co.

79—RATCHET WRENCH speeds fitting assembly

Of heavy duty construction, the cadmium plated steel Kwik-Tite Ratchet Wrench is claimed ideal for work in



close quarters. It is suggested for making up tube fittings, pipe fittings and hydraulic hose fittings, and for fastening machine nuts and hex fasteners. To use this tool, you place the jaws over the side of the nut and lift the handle slightly. The wrench will snap close and ratchet. Once the wrench is in position, the harder you pull the tighter the jaws close, according to manufacturers, and to remove it, you apply a light pressure, moving the handle forward and down, and this causes the jaws to snap open. The Imperial Brass Mfg. Co.

80—SMALL BRASS PUMP operates submerged in fluid

This fractional horsepower pump is designed to operate while fully or partially submerged in lubricant fluids, machine tool coolants, citrus juices, other fluids. Housings and covers are Western Yellow Brass Alloy No. 30 of Olin Mathieson Chemical Corp., said to offer long service, resistance to corrosion in various liquids, and economy of fabrication. The pumps sell for around $20 to $30. come in three models with capacities

from 200 to 514 gph. They are sealed in oil, come equipped with molded Neoprene cord sets, high torque-low temperature motors, stainless steel shaft. Thomas Beckett & Co., Inc.

Reader Service Cards on pages 237-238 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

81—CENTRIFUGE all-hermetic, high capacity

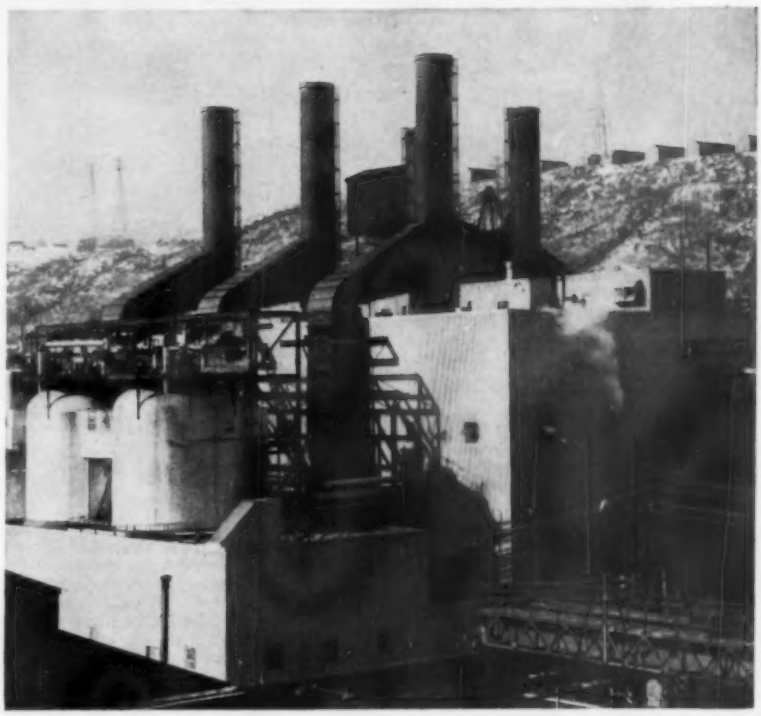
The all-hermetic, 5000-gph DeLaval SRG-214 is designed to separate or clarify viscous or inflammable materials, or those which must be kept

from contact with air. Of particular interest is its use for water washing some of the new long-chain plastic materials under conditions of high temperature and pressures. A disc-type constant efficiency centrifuge, it has long-life seals at inlet and outlets to assure air-free operation at pressures to 125 psig, so that the feed material enters and is maintained under positive pressure. As a result, the machine is reported well-suited for high-capacity vegetable oil refining and degumming. Except for the frame, which is cast iron, all parts are stainless steel. The machine requires 20 hp, can be used with direct motor drive or supplied with V-belt pulley for separate motor drive. Bowl diameter is 24 in.; speed, 4400 rpm. The DeLaval Separator Co.

82—AIR HOIST with choice of throttle, brake

The JCP-120 is an air powered hoist which offers a choice of several throttle and brake systems to adapt it for use in a variety of applications, such as car spotting, barge spotting at docks, etc. Hoist has a lifting capacity from 27,000 lb at 37 fpm to

HOW HAGAFILM® ELIMINATED $10,000 A YEAR POWER PLANT CORROSION COSTS



Quick case history—reading time 52 seconds

THE PLANT: Large power station serves U.S. Steel's National Tube Division at McKeesport, Pa. Monongahela River water is used for boiler make up.

River water is clarified with Hagan Coagulant Aid and alum, softened with lime and soda ash and deaerated for use in boilers. Desuperheating condensate system was forecast as corrosion weak spot because of high CO_2 in steam. To evaluate cost of maintenance versus treatment, National Tube engineers adopted a "wait and see" policy.

THE PROBLEM: Magnitude of corrosion was almost unbelievable. Standard 1" x 2" x 20 gauge carbon steel test strips pitted through within 24 hours. Low pressure heater shells had to be continually patched. Spill-over lines and fittings failed almost weekly. Maintenance costs rocketed to a high of $10,000 a year.

THE SOLUTION: Treatment with Hagafilm reduced corrosion rate from a no treatment level of 1285 to less than 1 mg/dm²/day with a 4 ppm feed; and to a range of 5 to 10 mg/dm²/day with a 2 ppm feed. Present feeding is 3 ppm.

RESULTS: Since introduction of Hagafilm four years ago, no failures have occurred in spill-over system lines and fittings. Corrosion in entire system has been arrested.

National Tube engineers say that Hagafilm treatment has already paid for itself many times over in reduced labor and maintenance costs.

FOR FULL INFORMATION on Hagafilm, write for free Bulletin 410-12-7.

HAGAN
CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PA.

HAGAN DIVISIONS: CALGON CO.–HALL LABORATORIES–BRUNER CORP.

For more facts circle 618 on Reply Card

C&D AutoCal*
Unitized Power-Pack

Popular mounting arrangement shows how *AutoReg*® Silicon Charger mounts inside switchgear cubicle door with controls projecting through. No manual switching or other adjustment required. PlastiCal® batteries need watering only once a year.

New C&D *AutoCal *unitized* Power-Pack is specially designed for dependable switchgear tripping and control**

Simple *AutoReg*® voltage regulated, current limiting Silicon Charger, paired with long-life PlastiCal® battery, assures high-capacity d-c power in compact package that is virtually *maintenance-free.*

Now, utilities and industrial plants can guarantee an even greater margin of reliability and protection for switchgear and control equipment. The amazing new C&D *AutoCal unitized* Power-Pack always assures full power for tripping and control.

Here, for the first time, is a dependable, high-capacity power package *specially designed for tripping and control.* Virtually maintenance-free . . . with no manual switching or adjustment required . . . *AutoCal* provides many times the life of ordinary battery and charger combinations which may be *adapted* to this critical service.

AutoCal pairs the simple, compact *AutoReg* Silicon Charger with powerful PlastiCal lead-calcium-grid control batteries. A sudden demand for tripping power merely discharges the battery over a short period. While the breaker is tripped, PlastiCal supplies any necessary constant load current as might be required for the operation of pilot lights, holding coils, and similar requirements. Once the circuit is reclosed, *AutoReg* puts energy back into the battery at a high rate until it levels off at full charge.

Here's self-protected charging . . . no charger adjustment or maintenance . . . and 25-year-life PlastiCals only require watering once a year!

For full details—write for Bulletin AR-102 today!

ON CUBICLE DOOR | ON WALL | WITH OUTDOOR SWITCHGEAR | ON RELAY RACK

C&D BATTERIES
of Conshohocken, Pa.... Attica, Ind.
DIV. THE ELECTRIC AUTO-LITE CO.

Manufacturers of *Ever-Ready*® Industrial Batteries • PLASTICELL® * and PLASTICAL® Batteries for Communications, Control and Auxiliary Power • Producers of *Autolog*® Silicon Chargers

*Trademark: *AutoReg*® *Silicon Charger and PlastiCal*® *Battery*

For more facts circle 619 on Reply Card

NEW PRODUCTS

(Begins on page 150)

3,700 lb at 220 fpm. A five cylinder radial air motor (10, 17 or 23 hp) with integral gear case drives the large rope drum through a multiple roller chain. Rope drum has a capacity of 2300 ft of ¾-in. wire rope. For portability, entire assembly is mounted on a skid type base. Controls are on the hoist, but can be removed and operated from a remote position. It can also be equipped with electric motor drive of 10 to 25 hp or air-cooled gasoline or diesel engine drive. Joy Mfg. Co.

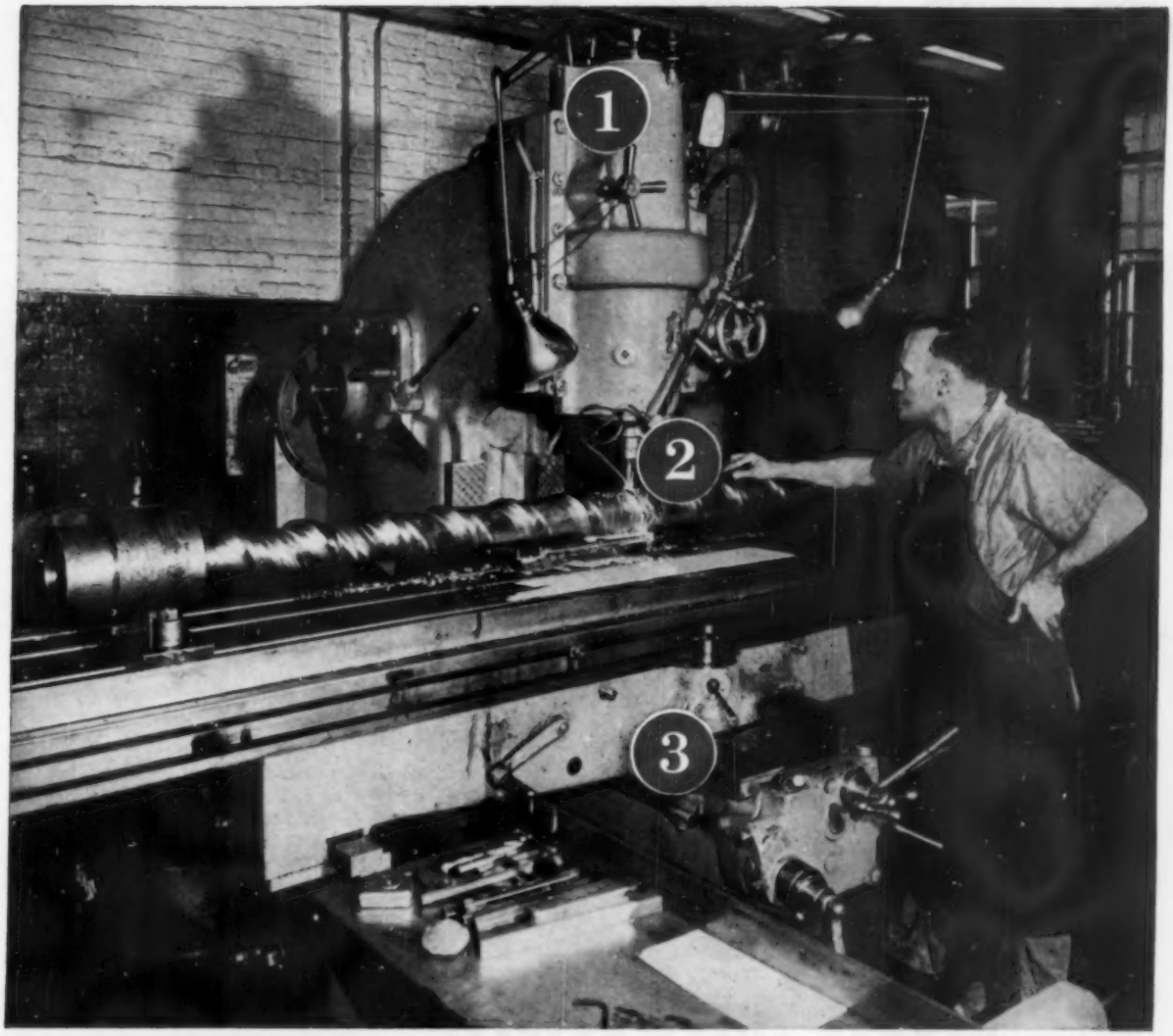
83—SUBMASTER CONTROL for heating, processing

Series 200 Submaster Regulator is introduced for control of remotely readjusted temperatures in heating, air conditioning, and industrial processes. It is a pneumatically operated temperature controller, whose control point is reset by a master controller or positioning switch. The master may be a thermostat, hygrostat, pressure reg-

ulator, or manual positioning switch, and has a throttling range adjustment of 0 to 35 per cent. The gas-filled thermal system is claimed unaffected by cross ambient bulb and capillary temperatures and eliminates need for bulb elevation correction. It is provided with direct action and reverse adjustment, both convertible. Typical applications include fan discharge control, remote process control, hot water zone supply, dewpoint control. Features announced include compactness, a universal mounting suitable for panel or surface mounting. More details are in Form P-73. The Powers Regulator Co.

84—FLEXIBLE HOSE conveys liquids under pressure

Interlox Pressure Hose BD-15 is available in coated galvanized steel, stainless steel or phosphorbronze, and is designed for conveying hot or cold



IMPROVING FEEDS AND FINISHES... WITH ESSO LUBES

1. NEBULA® EP GREASE helps bearings run true longer . . . maintains precision running of plain and anti-friction bearings. Exceptional for its stable consistency, oxidation resistance and load-carrying ability throughout a wide temperature range.

2. KUTWELL® EP 66 CUTTING OIL speeds fine finishes . . . increases tool life; permits higher speeds and deeper cuts. Leaves an easy-to-see film for highly efficient lubrication. Contains a bactericide to keep emulsions sweet smelling and serviceable for longer periods.

3. FEBIS® K LUBRICANTS insure smooth-sliding ways . . . boost precision by eliminating "stick-slip" movement. These lubes actually make static friction less than sliding friction; easily pass the stick-slip test.

There's a complete line of specialized Esso Lubricants to help improve your operations. Contact your local Esso office or write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, New York.

Esso

In Industry after Industry..."ESSO RESEARCH works wonders with oil"

For more facts circle 620 on Reply Card

NEW PRODUCTS

(Begins on page 150)

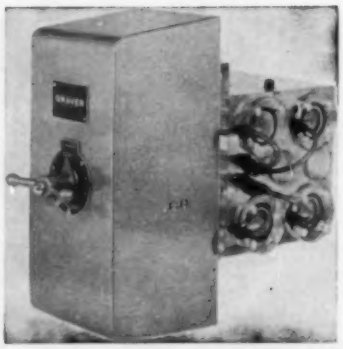
liquids under pressure. The phosphor-bronze type is suggested for use where it is desirable to reduce magnetic permeability and to resist seasonal weather cracking. Nine sizes range from ½ to 3 in. ID. The International Metal Hose Co.

85—CEMENT CLEANER is concentrated liquid

Omega is compounded from high aromatic solvents and heavy-duty detergents. Water dilutable, water soluble, and water dispersible, this liquid is claimed to clean heavily contaminated floors of oil and soil. When diluted the product is non-flammable, says manufacturer, and it will not harm paint or wiring. Omega may also be used for degreasing machinery, motors, oil equipment. Omega Co.

86—CONTROL VALVE for water treating equipment

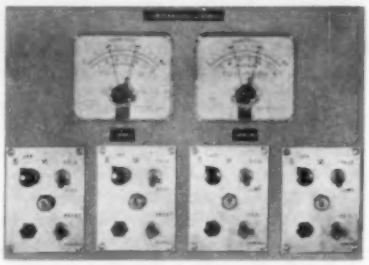
Monotrol is a single control valve for directing flow of liquids in zeolite softeners, ion exchange units and filters. Designed to perform functions



of a nest of individual valves while providing easier operation and maintenance, it comes in cast iron or acrylic plastic (shown) and can be operated manually or automatically. Features announced are pilot control, positive hydraulic pressure actuation and easy maintenance. Internal parts can be removed without dismantling the connecting piping or removing the valve from the unit on which it is used. The design is also said to provide for low pressure loss during operation and to prevent contamination of effluent with influent. Graver Water Conditioning Co.

87—TEMP SCANNER monitors up to 50 points

This modular temperature scanner is designed to scan and monitor up to 50 modular assemblies of temperature-sensitive elements (thermocouple or thermistor). The modules consist of relays and potentiometers mounted on a plug-in base. Each module is a com-



plete unit, identical to every other module in design, configuration. New points may be added by plugging in a module and connecting the sensor leads. If more than 50 points are required, more scanners are used.

The scanning indicator (meter relay) reads each point successively from 1 to 50 and sounds an alarm and lights the numbered module of any point exceeding the limit. The scanner continues to scan all points below trip level, regardless of how many have exceeded the alarm point. The monitoring indicator (meter relay) continuously reads any one selected point; it also sounds an alarm and lights module light if selected point exceeds limit. Tipptronic, Inc.

REDUCE THEFT LOSSES!

Do you know that employee theft of company-owned tools, supplies, etc. totals more than 200 million dollars per year? That's right! . . . and *your* company is paying a portion of that "bill". That's why you'll find low-cost Phoenix wire mesh partitions one of the best investments you can make. For simply by erecting Phoenix partitioning around your tool rooms, store rooms and other such areas, you will *substantially* decrease the "mysterious disappearance" factor that even now is costing your company untold sums of money. And your savings in reduced theft losses will, *in fact*, pay for your Phoenix partitioning many times over. Want more details? Write today for the new Phoenix bulletin on Wire Mesh Partitions. It's yours for the asking!

SINCE 1885 ONE OF THE NATION'S LEADING MANUFACTURERS OF WOVEN WIRE PRODUCTS

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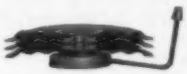
For more facts circle 621 on Reply Card

Your USG Distributor can help you . . .



PICK Ni-Span "C" low pressure elements for exceptional thermal stability.

PICK exact Bourdon tube to meet stress, over-pressure, pressure range.

PICK Supergauge® for long life, accuracy to 0.5%.

PICK Solfrunt® for accuracy to 0.5%, solid-front safety from blow-outs.

can show you faster deliveries, more savings, widest choice

A closer look, for example, at the time spent in buying gauges from this source and that . . . or at the cost of not getting the right gauge for the right job. Then—a closer look at the nearest United States Gauge distributor . . . his facilities, service, skills in application engineering, and his USG line. He can help you pick from over 50,000 standard USG indicating dial pressure gauges . . . and thousands more in specials. The widest choice anywhere! He can streamline gauge buying, tighten up on costs, help you get the gauge accuracy and performance you need for the purpose and price . . . with one line that covers 99% of your gauge needs. Note the few examples illustrated here. Then, check the Yellow Pages for a line to your United States Gauge distributor and *simplified* money-saving *one source* buying. Or write direct for catalogs and name of your distributor.

UNITED STATES GAUGE

Division of American Machine & Metals, Inc. • Sellersville, Penna.

PICK Test Gauges for dependability, and accuracy as high as 0.2 of 1%.

PICK Recorders and Recording Controllers built to stand vibration, pulsation.

PICK A-Line for premium reliability, accuracy to 1%, and savings up to 40%.

PICK Arc-Loc® Movement for longer life, easier and lower maintenance.

PICK U. S. Gauge Indicating Controllers or Transmitters for reliability.

For more facts circle 622 on Reply Card

For more facts circle 623 on Reply Card ⟶

NEW PLANT CONSTRUCTION —advance information on location, costs

Fairfield, Ala.—United States Steel Corporation's Tennessee Coal & Iron Division, P. O. Box 599, Fairfield, Ala., will expand local plant here by about 100 per cent. Work on the expanded distillation facilities at the company's coke and coal chemical works will get under way at once and is scheduled to be concluded by this summer.

Stuttgart, Ark.—Arkansas Grain Corp., Stuttgart, Ark., plans to construct a soybean oil extraction plant. Work on the plant will get under way at once and will go into production about the last quarter of 1960. Plant will cost about $1.5 million. French Oil Machinery Company, Piqua, Ohio, will engineer the project.

Torrance, Calif.—Aerocal Division of Aeronca Manufacturing Corp. plans major expansion program at local facility here and has already broken ground for a 50,000-sq ft addition. Work on the plant addition will get under way soon for completion by 1961. Cost reported to be $700,000.

Middletown, Conn.—Feldspar Corporation plans to construct a modern feldspar flotation plant. Plant is expected to be in partial production by late this year and will cost a reported $1 million when completed.

Tampa, Fla.—Continental Can Co., 100 E. 42nd St, New York, N. Y., has authorized a major expansion program here of company's lithographing and shearing operations. Plant expansion will include a 100,000-sq ft addition for manufacturing and processing of company's products. Work is already under way on the new facility which will be completed in the fall of 1960. Paul Smith Construction Co., 310 N. Rome Ave., this city, has been awarded the construction contract, approximating $1 million.

Atlanta, Ga.—Southern Land, Timber and Pulp Corporation plans to construct a pulp and paper mill to be located in southwest Georgia. Initial capacity of the proposed mill will be about 400 tons per day of paper pulp. Cost of the new facility will be about $40 million.

Chicago, Ill.—Zenith Radio Corporation, 6001 W. Dickens St., this city, is constructing a major addition to company's Kostner Avenue manufacturing plant. Work on the 115,000-sq ft addition, which will be used chiefly for assembly operations and for component-manufacturing activities, is scheduled for completion by the summer of this year. Cost of the new facility is expected to exceed $1.25 million.

Indianapolis, Ind.—National Starch & Chemical Corp., 268 Madison Ave., New York, N. Y., plans to increase by one third the plant capacity of its corn mill located here. When completed the program will bring the mill's annual grind capacity to seven million bushels of corn.

Rushville, Ind.—Perfect Circle Corp., Stout St., Hagerstown, Ind., plans to construct a large foundry for the production of piston rings. Facility will have triple the capacity of the present foundry. Construction of an 80,000-sq ft building to house the foundry will begin as soon as practicable and should open late in 1960 or early in 1961.

Baton Rouge, La.—Air Reduction Sales Co., Division of Air Reduction Co., 150 E. 42nd St., New York, N. Y., announces that work is already under way on the construction of a new facility to be used as an air separation plant. Plant is expected to go into production late in 1960 and will cost

HOW YOU MAY CUT YOUR MACHINE FAILURES BY AS MUCH AS 25%

by J. R. RATCHFORD, Specialist, Lightning Arresters and Cutout Marketing

Experience shows that 25% of failures of unprotected rotating machinery are due to lightning.

With percentages like that against you, lightning and surge protection is imperative. The cost of this protection is a small fraction of the a-c motor or generator investment, and can be as low as 1/100th the cost of only one large a-c machinery repair. General Electric lightning protective equipment is available for all ratings of a-c machine operating voltages.

The Pyranol* protective capacitors in the G-E system provide turn-to-turn insulation protection by reducing the steepness of applied lightning surges and reflections within multi-turn machine windings. The Thyrite* Magne-valve station-class arresters protect the major (line to ground) insulation by limiting the magnitude of incident and reflected surges on the windings. Used in parallel, this combination effectively combats lightning-caused machine downtime and resulting repair costs.

May we show you specifically how you can protect your a-c rotating machinery? Contact your General Electric representative for full details or write to Sect. 435-24, General Electric Co., Schenectady 5, N. Y.

* Registered Trademark of the General Electric Company.

GENERAL ELECTRIC

General Electric Capacitor-

in excess of $2 million when completed. H. E. Wiese, Inc., 2155 Sorrel Ave., also of this city, has been awarded the construction contract.

Ishpeming, Mich.—Humbolt Mining Company, jointly owned by Cleveland-Cliffs Iron Company and the Ford Motor Company, plans to expand its iron ore mining and concentrating operations, near here, by installing two parallel lines of grate-kiln systems. In addition to the process equipment, plant expansion will include power transformers and regulators, electrical switch-gear motor controls and numerous motors. The facility is scheduled to go into production of iron ore pellets by mid-1960.

St. Paul, Minn.—Minnesota Mining and Manufacturing Co., 1000 Fauquier Ave., this city, plans to construct an administration facility at company's research center located here. Building will be a 14-story structure of brick, concrete and steel and is scheduled to be completed in 1962. Cost of the structure, with equipment, is reported to be about $10 million.

North Kansas City, Mo.—Owens-Illinois Glass Company, Ohio Building, Toledo, O., plans to build a plant for the manufacture of semi-rigid plastic bottles, along with additions to plants at St. Charles, Ill., and Glassboro, N. J., to meet the ever increasing demand for this product. Work on the Kansas City development will get under way soon for completion early in 1961.

Macedon, N. Y.—Kordite Corporation, 3848 Richard Street, a subsidiary of National Distillers & Chemical Corp., plans to construct a $2-million research center on site selected in this Wayne County village. Work on the center will begin at once and when completed early in 1961 will be devoted to research in plastics and the packaging fields.

Newark, N. J.—Agfa, Inc., a West German corporation, plans to construct a plant for processing color film in this city. Construction will get under way this spring with completion scheduled for the end of 1960. Building will be of reinforced concrete with considerable glass interior and will be two stories high, with a basement from which machinery will extend into portions of the first floor. Cost will be $500,000.

Cleveland, O.—Jones & Laughlin Steel Corp., 462 Gateway Center, Pittsburgh, Pa., has authorized plans for a program to modernize and cut costs. Program, which will include construction of oxygen steel making furnaces, is reported to be a $50-million undertaking. When completed these will be the largest of such furnaces in the world, with a rated capacity of 100,000 tons a month. They are scheduled to go into production late in 1961.

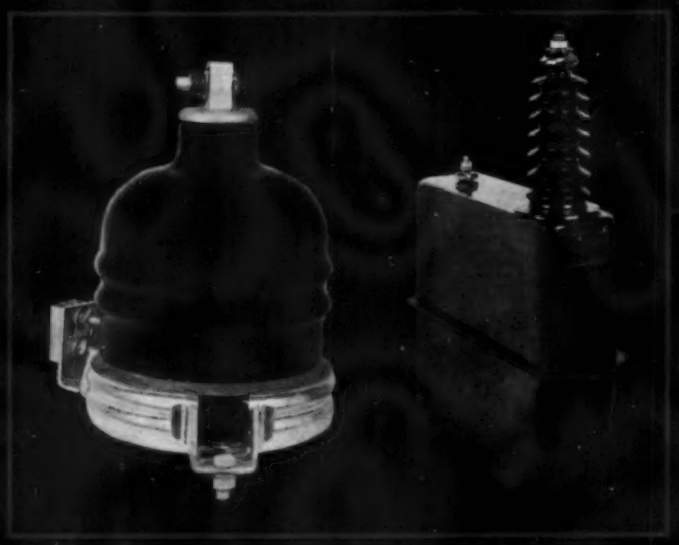
Brookville, Pa.—Sylvania Electric Products, Inc., a subsidiary of General Telephone & Electronics Corp., 1740 Broadway, New York, N. Y., plans to construct a manufacturing plant for electron tubes. The new 100,000-sq ft facility will replace three existing plants now located in this city, totaling 60,000 sq ft. Work on the multi-million dollar facility will be completed by the spring of 1961.

Cheraw, S. C.—J. P. Stevens & Co., 1460 Broadway, New York, N. Y., will start work soon on the construction of a new textile finishing plant at a cost in excess of $3 million. Plant will be located on building site recently acquired and will contain approximately 250,000 sq ft of floor space. Company hopes to have the new facility in operation by the summer of 1960.

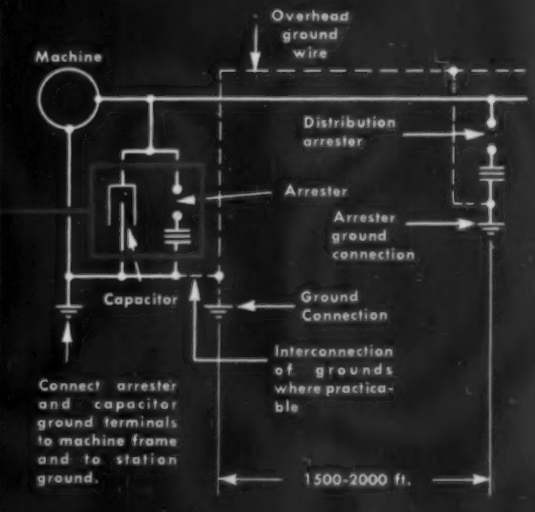
Greenland, Tenn.—American-Saint Gobain Corp. plans to construct a plate glass plant on a building site recently acquired for the purpose. Equipment will include twin polishing machines used in conjunction with two grinding lines. Plant is scheduled to go into production in 1962 and will be a multi-million dollar investment.

(Continued on page 214)

Arrester Combination Gives You Low-Cost Lightning and Surge Protection for Your High Investment in A-C Rotating Machines



Thyrite Magne-valve station-class arrester Pyranol filled capacitor



Typical scheme of protection for machines connected directly to exposed overhead lines

GENERAL ELECTRIC

New Plant Construction

(Continued from page 213)

Nashville, Tenn.—Ferro Corp., Harvard and E. 56th St., Cleveland, O., plans major expansion of company's Fiber Glass Division, located here. Increased facilities will include an additional glass melting tank, fiber-producing bushings, fabricating machines and warehouse area. Expansion program will be completed by late 1960.

Longview, Texas—Eastman Kodak Company, 343 State St., Rochester, N. Y., plans to construct a polypropylene plastics plant on large building site located here. Plant will be erected and operated by Texas Eastman Company, a division of Eastman Kodak. It will have a capacity of 20 million lb of polypropylene a year.

Port Neches, Texas—Goodrich-Gulf Chemical Company, 2069 E. 9th St. Cleveland, O., plans to enter the polyethylene field with a new plant to be located here. Company, jointly owned by B. F. Goodrich Co. and Gulf Oil Corp., expects to complete the plant in late 1960, for the production of a new high density kind of polyethylene of a type not currently produced in this country. Plant will have an initial capacity of 13 million lb annually.

Rosenberg, Texas—Michigan Seamless Tube Co., 400 West Ave., South Lyon, Mich., has announced a $5.5-million expansion program that will increase company's capacity of seamless tubing to 95,000 tons per year. Included will be a new hot mill with a German-made extrusion press. Program is scheduled for completion July, 1960.

Texas City, Texas—Monsanto Chemical Company, 1700 S. Second St., St. Louis, Mo., plans to increase production of styrene monomer by about 200 million lb per year. Work on the new unit will get under way at once and the first stage of the new facility is expected to be in operation by the first quarter of 1961.

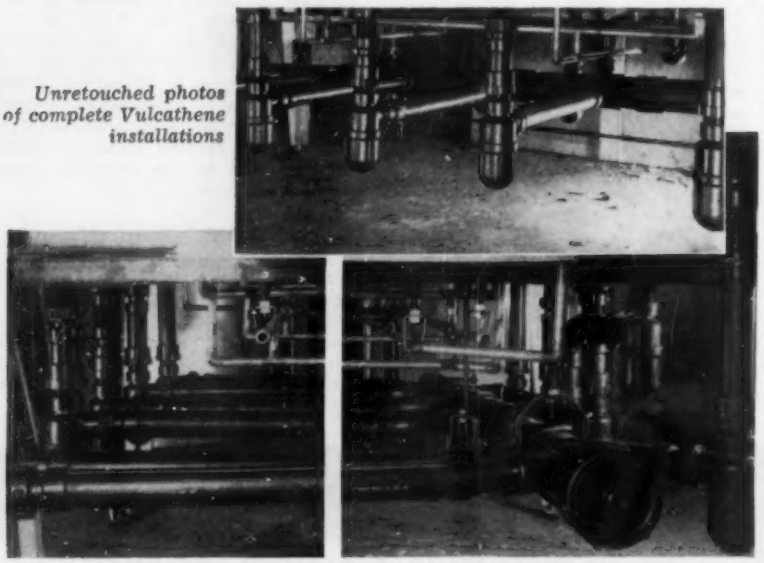
Martinsburg, W. Va.—Corning Glass Works, 1946 Crystal St., Corning, N. Y., plans to build a new plant for the manufacture of cooking utensils. Construction will begin as soon as ground preparations are completed. New facility will have a floor area of 244,000 sq ft.

New Martinsville, W. Va.—Mobay Chemical Co., Pittsburgh, Pa. plans to increase capacity of tolylene diisocyanate, at its local plant here to over 25 million lb annually. Work on the expansion will get under way soon for completion by late fall of 1960.

Weirton, W. Va.—Weirton Steel Co., 1935 Stillwell St., will start construction this spring on two generating plants for the production of high purity oxygen. Air Products, Inc. will build and operate the generating plants on property of the steel company. Plant will be designed to produce 650 tons of 95 per cent pure oxygen daily and will supply oxygen for the steel company's use.

Grays Harbor, Wash.—Rayonier, Inc., 161 E. 42nd St., New York, N. Y., plans an expenditure of $7.5 million for the conversion of its sulfite mill for the production of chemical cellulose from an ammonium-base process to a sodium-base process. Work on the conversion will get under way at once and plant will be in operation in 1961.

Unretouched photos of complete Vulcathene installations

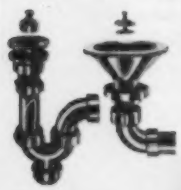


for Maintenance-free Plumbing

Acid-Resistant **Vulcathene®**

Gives you the most practical and long-lasting plumbing yet devised for drainage

Besides being corrosion resistant and acid-proof, VULCATHENE plumbing has the definite advantage of being practically maintenance free. The inner walls of VULCATHENE plumbing are always *smooth*. There is *no scaling*. Waste and sludge flow through unimpeded. Nothing adheres.



Even after years of service VULCATHENE is still slippery smooth permitting the easy, *constant* flow of waste. That is why VULCATHENE installations remain in excellent condition *indefinitely* and require little or no maintenance.

There's more to the Vulcathene story . . . write Dept. P1

American Vulcathene

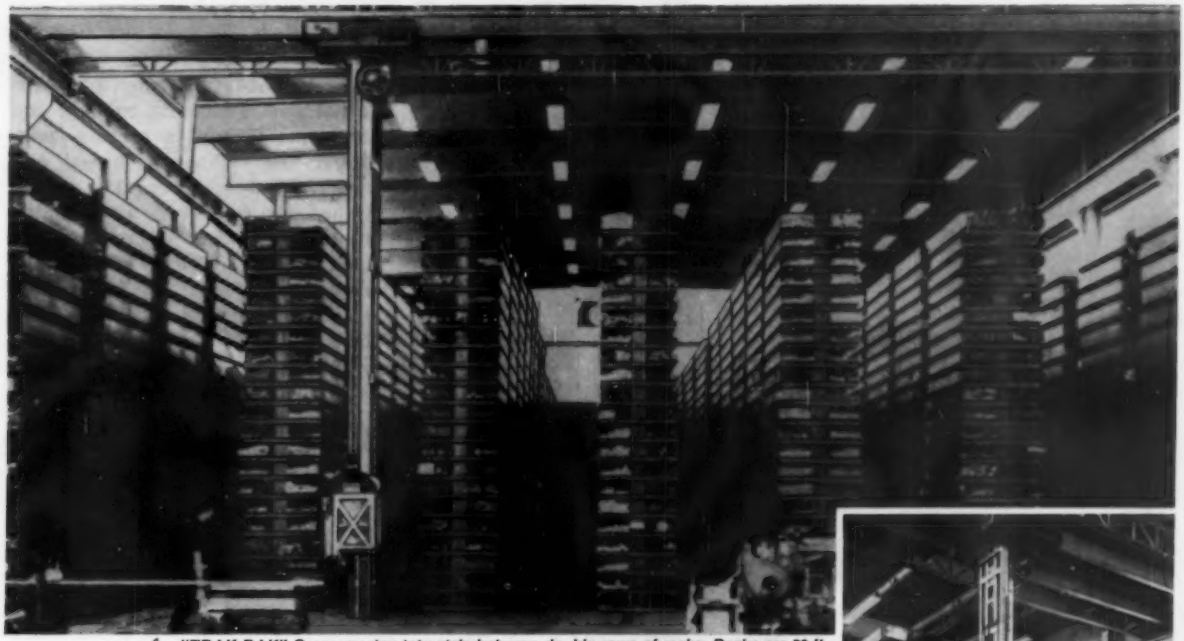
P.O. BOX 365 ROCHESTER 2, NEW YORK

DIVISION OF THE NALGE CO. INC.

"That isn't our complete line. I couldn't get anymore in my brief case."

Steel Warehouse Handles 3500 Stock Items with "TRAK-RAK" Crane

——— *Reduces Operating Costs... Speeds Service*



1. "TRAK-RAK" Crane moving into aisle between double rows of racks. Racks are 20 ft. high. Distance from floor to underside of roof truss is 30 ft. Aisle width is 5 ft.-4 in.

Edgcomb Steel of New England, Inc. warehouses 3500 different items of steel, stainless steel, brass, and aluminum bar stock in an area 60 feet wide, 27 feet high, and 160 feet long.

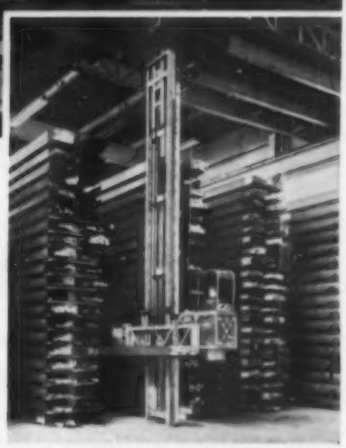
ONE man and a "TRAK-RAK" Crane serve the five double rows and two single rows of "Christmas Tree" racks which hold 2700 storage trays. Edgcomb processes approximately 2500 to 3000 orders per month, and the company reports very favorable reductions in operating costs and faster order processing and delivery.

Edgcomb's "TRAK-RAK" Crane has a traveling bridge (Photo 1) which spans the storage bay, and an overhead trolley from which is suspended an electrically operated rotating column equipped with a carriage for handling the storage trays. All operations of the crane and carriage, which rotates, moves toward or away from the racks, and raises or lowers on the column, are controlled by the operator who rides with the carriage. Safety switches prevent the column from running into a rack and permit full rotation only when the unit is safely beyond the end of the racks.

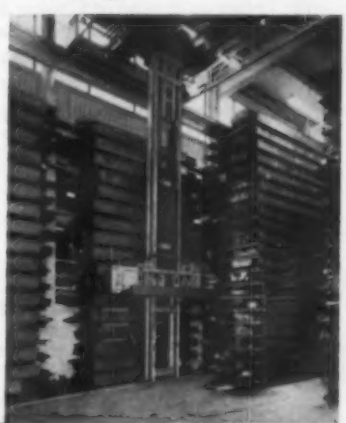
Hundreds of "TRAK-RAK" installations, designed to meet the user's particular requirements are in use today. They are handling many types of material and loads with great speed and economy. Specific advantages the "TRAK-RAK" System of vertical storage and handling brings to the user are:

1. **Maximum utilization of the cube to permit storing and handling more material in less floor area.**
2. **Faster material movement in and out of storage.**
3. **Reduction in personnel and lower labor costs.**
4. **Improved safety, better housekeeping, precise inventory control.**

Take the first step toward faster, more efficient material storage and handling now. Write for complete details on "TRAK-RAK." Chicago Tramrail Engineers are available to discuss your handling problem with you at any time—and at no obligation to you.



Crane with operator, who rides with carriage, emerging from aisle with loaded stock tray.



Picking up or depositing stock trays on the rack is a fast, safe operation. Trays and rack sections are color coded for quick location and identification.

CHICAGO TRAMRAIL CORPORATION
1324 SOUTH KOSTNER AVENUE • CHICAGO 23, ILLINOIS

Specialists in the design, manufacture and installation of material handling systems for steel warehouses and other industries

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STANDS TOUGHEST SERVICE
DRIVES HEAVIEST LOADS

ATLAS

OFFSET SIDE BAR ROLLER CHAIN
PRECISION BUILT...HEAVY LOAD CHAIN

PRECISION CLEARANCES for efficient operation . . . accurate fit and smooth bearing surfaces.

PINS TOUGHENED for shock loads. Precision hardened rollers, bushings and links to stand severe operating conditions.

DETACHABLE ASSEMBLY makes link replacement easy. Chain made up of series of identical links held together with cottered or riveted pins. No searching for connecting link.

BUILT-IN MISALIGNMENT COMPENSATION to allow for sprocket variance. Requires same sprockets as for standard roller chain.

This is the chain to handle heavy loads under extremely difficult operating conditions. Made in sizes from No. 3100 single width to No. 3160-2 double width. For complete details and power transmission advice write or call . . .

ATLAS CHAIN & MANUFACTURING COMPANY
Subsidiary Prudential Industries, Inc.
West Pittston, Pa.

GET YOUR COPY OF THE NEW FOLDER ON HEAVY DUTY CHAIN!

ATLAS
PRUDENTIAL INDUSTRIES
ATLAS

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How Clean Can You Get?

(Continued from page 109)

normal heat convection is held to a minimum by enclosing heating units in the wall. This provides air-heated panels with a radiant effect.

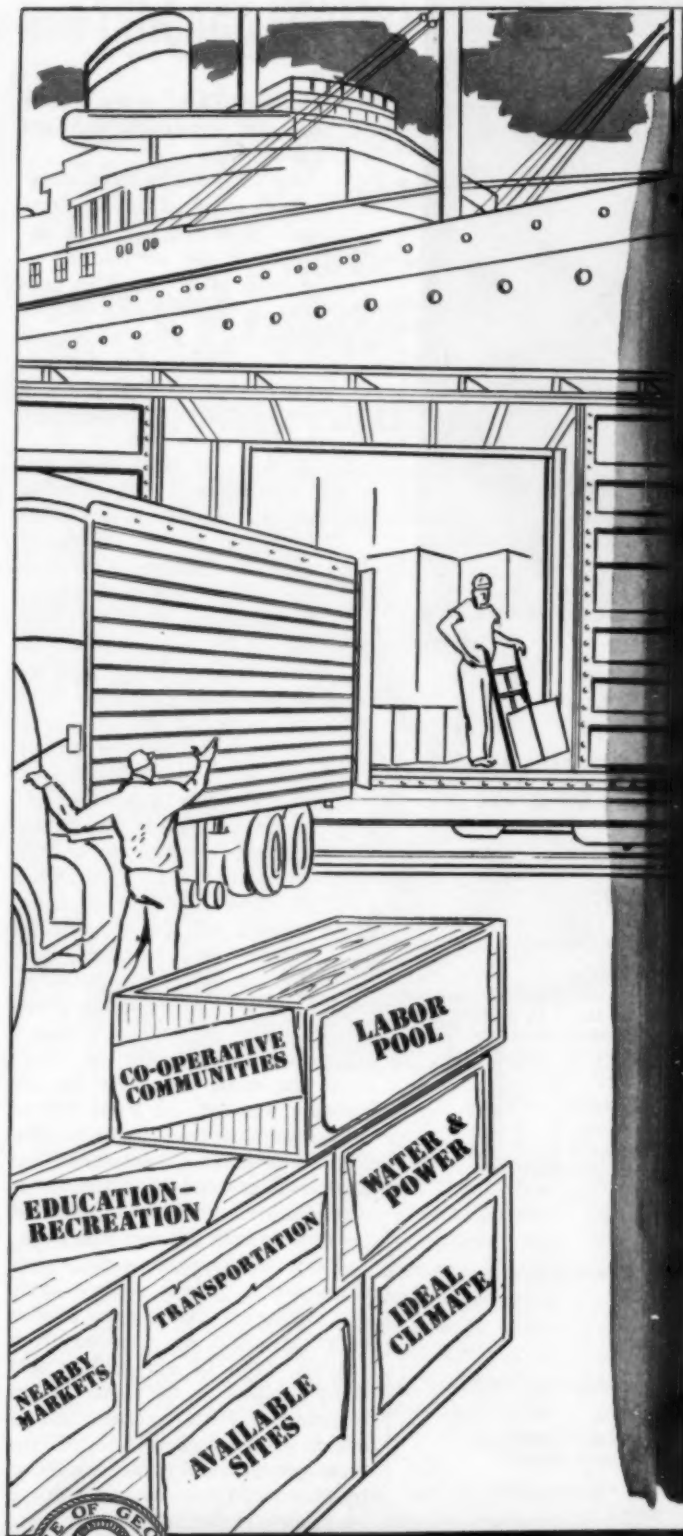
Instead of providing the usual metal duct system to conduct and distribute the air, a plenum space above the ceiling in critical and supercritical areas receives conditioned air from two air handling units. Short duct assemblies with dampers and supply air diffusers control the distribution of air from the plenum to the production spaces being served.

All air supplied to the plenum is subcooled, and reheating to the 40 per cent relative humidity is achieved by hot water coils in the supply openings.

Air is discharged into the plenum so as to maintain a static pressure in the supercritical area of 0.2 in. of water higher than critical area. Static pressure in the critical area is 0.1 in. of water higher than in the non-critical area, and the non-critical area is maintained at a pressure of 0.05 in. of water above atmospheric pressure. In this way, positive air pressure in the supercritical area bleeds to critical and then to non-critical areas so that airborne dust cannot enter the sealed areas. Special care was necessary to insure tightness of the plenum space as the positive pressure must be maintained at all times.

Non-critical manufacturing space, which contains automatic screw machines, grinding machines and other production equipment, has a separate partial cooling system. In this area, where there is a large heat gain generated by many machine tools, conditions are held to a maximum of 95 F dry bulb and 50 per cent relative humidity when the same conditions exist outdoors. All air to the non-critical area passes through glass fiber filters of the throw-away type installed in the air handling equipment.

All of the plant air conditioning equipment is supplied with chilled water at 42 F cooled by hermetically sealed centrifugal units located in the boilerroom. Each of three units has a refrigerating capacity of 175 tons. **End**



GEORGIA DELIVERS A COMPLETE PACKAGE DEAL

Georgia has become one of America's top leaders in production and industrial growth. A great labor pool, capable of learning new skills, provide new industries with an important tool for future planning and expansion.

Georgia's educational and recreational facilities, abundant water and power, healthy year-round climate . . . all combine to make it good business to produce in Georgia.

Nearby growing markets and unlimited transportation facilities are vital, important parts of Georgia's COMPLETE PACKAGE FOR INDUSTRY. . . a package that delivers the needed ingredients for profitable year-round operations in an increasing competitive era.

Write today for information on a package deal (including financing) to fit your needs.

go-Ga.

ABIT MASSEY, Director
GEORGIA DEPARTMENT OF COMMERCE
100 State Capitol Building • Atlanta, Georgia

For more facts circle 627 on Reply Card

with new **Carbo Zinc 11***

CARBOLINE'S NEW ZINC FILLED *INORGANIC* COATING FOR GALVANIC PROTECTION OF STEEL

Becomes water insoluble 20 minutes after application

Sudden rainfall, night condensation or rising tide will not wash it off or affect curing.

Carbo Zinc 11 is not only a new coating, it is a new *concept* in zinc filled inorganic coatings, with desirable properties not found in other protective coatings. In only 20 minutes the coating becomes insoluble in water. It can be applied directly to damp surfaces, in 90-100% humidity and at temperatures as low as 0°F.

Only one coat provides long-lasting galvanic protection to steel surfaces in marine, coastal and offshore environments. It is also insoluble in organic solvents, and is highly recommended for lining of solvent storage and cargo tanks. And look at its other outstanding characteristics:

- Prevents subfilm corrosion
- Excellent water, brine and solvent resistance
- Economical — low material, surface preparation and application costs
- Does not blister — cures from inside out
- No curing solution required
- Brush or spray application
- In non-immersion service, can be applied over a commercial blast, brush blast or wirebrushed surface

Write today for complete information, technical data, uses and sample of this remarkable new coating—Carbo Zinc 11.

**Patent applied for*

carboline COMPANY

Coatings with Experience

32-T Hanley Industrial Ct.
St. Louis 17, Missouri

For more facts circle 628 on Reply Card

Air Leaks Gaged by Clock

(Continued from page 111)

sure air (30 psi) is the highest pressure permissible for blow guns.

3. To effect this reduced pressure a standard pre-set pressure regulator has been installed in the air line ahead of each blow gun. This permits a single piping system through the plant taking off high pressure for fixtures and taking off low pressure through the pressure regulator for blow guns. See Fig. 2.
4. A type of blow gun was found which is inserted inside the hose leaving only a small brass nozzle approximately the same diameter of the hose and some three quarters of an inch long, projecting outside of the hose. Air can be shot through the nozzle by merely flexing the hose from any angle. See Fig. 3.
5. A brass crimp type ferrule was found which is slipped over the hose first before inserting the airgun. This device is then clamped in a vise crimping the air gun inside the hose leaving a perfectly smooth surface around the outside diameter of the hose and leaving nothing sharp on which the operator might cut his fingers through repeated use.

At the same time that the air pressure was reduced from 100 to 30 psi for blow guns, an exhaustive study was made to determine the relative degree of effectiveness. It was discovered by these repeated tests (using both dry cast iron chips, and dry steel chips, as well as steel chips soaked in both coolant water and cutting oil) that a given volume of chips could be removed from various styles of our milling and drilling fixtures in the same amount of time with 30 psi pressure and an orifice diameter of .071 in. in the blow gun as could be accomplished by means of the brass gun with the ⅛ in. hole in the nozzle.

The second big problem with air leaks was one of the guns being tripped accidentally. The biggest source of this trouble was in trying

(Continued on page 220)

how CHICAGO SCREW saved

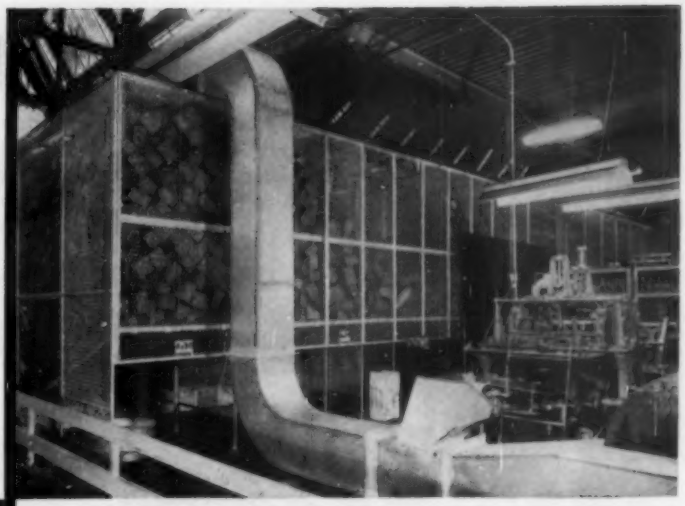
- *Handling Time*
- *Material Costs*
- *Installation Costs*

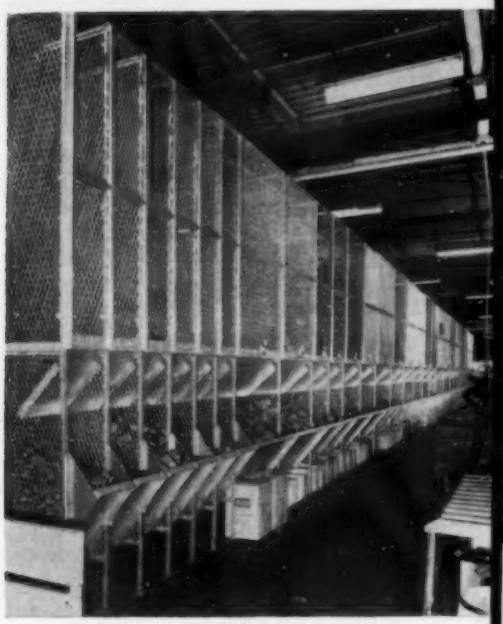
with Globe's

SAFE·GARD

(THE PARTITION THAT BREATHES)

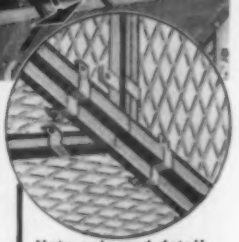
Expanded Metal Partitions





.....For Its New, Automatic Storage Bin Feeder!

STANSCREW boxes are air borne from box gluing machine and fed to proper bin as determined by the lever shown at top. Installation is 94 feet long with 32 bins ranging in width from 1 ft. to 6 ft., bins are 11 ft. high and 9 ft. deep.



Note enlarged detail showing SAFE·GARD Quik-Erect Clips securely joining the edges of the interchangeable expanded metal panels.

When Chicago Screw designed its new air operated automatic storage bin feeder to blow glued Stanscrew boxes direct from the box folding and gluing machine to the proper storage bin nearby, the natural material to use for the bins was Globe's SAFE-GARD Expanded Metal Partitioning with the exclusive QUIK-ERECT patented fittings. Completely prefabricated, with no on-the-job cutting or welding, the change over was fast and no shop tie-up occurred. Handling time was cut to a minimum as well as a major saving on material and installation costs.

SAFE-GARD can answer any of *your* enclosure problems too. It is an easier, simpler method of guarding conveyors and machines and for all in plant partitioning. Shipped *ready* for erection with no cutting, drilling or welding required. Interchangeable panels provide greater safety, cut over-all costs and require 85% less storage space. And the exclusive QUIK-ERECT section clips cut erection time to a minimum. SAFE-GARD welded panels give longer life, are stronger than wire and never ravel or fray.

Write today for catalog and full details, or call your Globe (Grip-Strut) Distributor. Look for him under "Grating" in your phone book.

PRODUCTS DIVISION

THE GLOBE COMPANY

4016 S. Princeton Ave. • Chicago 9, Ill.

For more facts circle 629 on Reply Card

Air Leaks Gaged by Clock

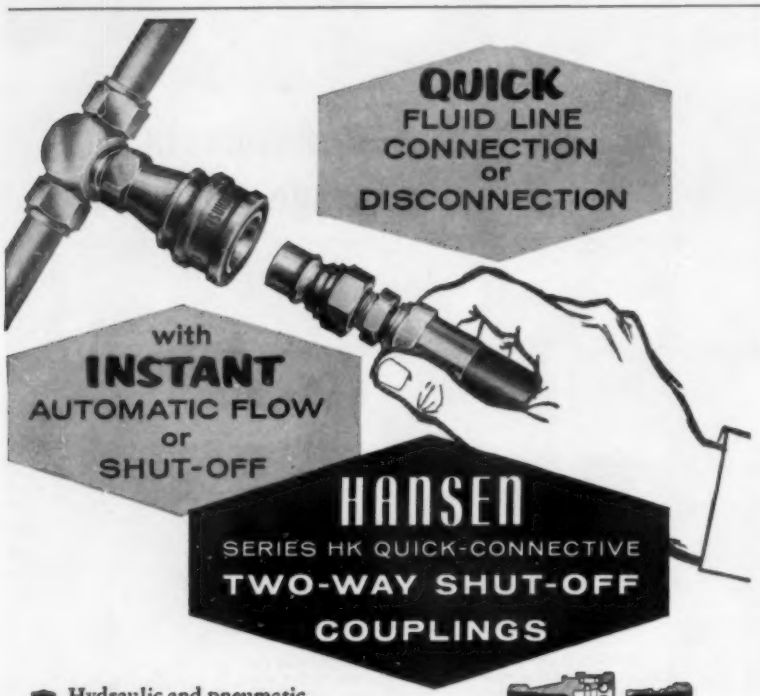
(Continued from page 218)

to provide a device that would "hang up" the gun when not in use. The clamp used in this suspension device would cock the gun in such a way that it would emit air constantly and create a rather bad leak. We corrected this condition by determining at what point on the machine the air hose was needed and suspending the hose above the machine in approximately this position. The hose is long enough to hang from the ceiling or from the machine at a point readily within the operators reach. When the operator is through he merely releases the hose and it hangs in a place handy to his grasp but away from the zone of operation of his machine. This licked the problem of air leaks caused when the gun was "hung up" by a wire clip on the side of the hose.

When the hose is first installed it is usually made six or seven inches longer than the optimum length so that as it wears out on the end (oil no longer affects the hose but over a period of years it actually wears out from handling) the end can be cut off. The air nozzle can be salvaged from the hose and recrimped in place salvaging the hose for further use.

We remove hose that is too short, replacing it with a longer one and reinstalling the shorter hose in a location that does not require as great a length.

Because we are using air rather than wasting it as our manufacturing operation has expanded through the years, the compressor equipment which ten years ago was too small is today handling twice the manufacturing capacity it did then and handling it nicely. From our experience in our own plant, and what I have seen in other plants I have visited, I am inclined to believe that more air is "wasted" than is "used". Why not take a look at your own operation? Perhaps you can save some money also by using more and wasting less of your compressed air! **End**

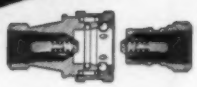


Hydraulic and pneumatic lines are quickly and easily connected with Hansen Two-Way Shut-Off Couplings. No tools required.

When Coupling is disconnected, valves contact valve seats in both Socket and Plug to provide instant and positive seal of fluid in both ends of line. Coupling does not depend upon line pressure to seal either end of line.

Six sizes are available, with female pipe thread connections from ⅛" to 1" respectively. Furnished either in steel or brass.

Representatives in Principal Cities ... See Yellow Pages



Instantly shuts off both sides of line... prevents loss of liquid, gas or pressure.

Quick-Connective Fluid Line Couplings for

COMPRESSED AIR • OIL
GREASE • HYDRAULIC FLUIDS
WATER • VACUUM • STEAM
OXYGEN • ACETYLENE
REFRIGERANTS • GASOLINE
COOLANTS • LP-GAS

Write for the Hansen Catalog

Here is an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes and types of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings.

SINCE 1915 — QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 35, OHIO

For more facts circle 630 on Reply Card

Tankless Pump System

(Continued from page 125)

the level in the suction protection tank.

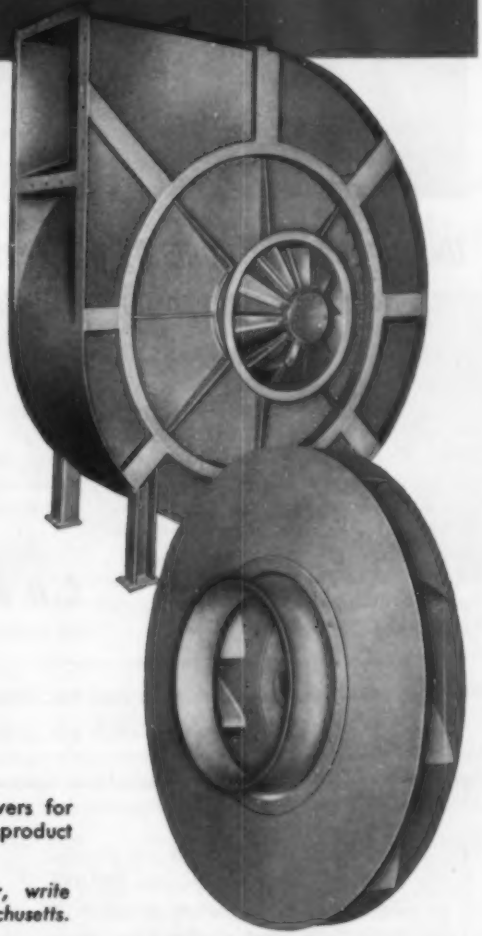
The control system is connected to an automatic valve that brings in city water if any stoppage occurs in the plant system. The switch-over would not even be noticed if it were not for alarms and indicating lights that help locate any trouble. The same alarm circuits provide protection against low suction and recycle the pumps automatically if there is a power failure.

This system turned out to have other advantages beside minimum space requirements. Construction costs were very low compared to those of erecting a tank. Pumps and controls are easily moved for relocation if this should be necessary.

Danger of tank freezeup was eliminated and the colder well water has a better quenching effect on the chain after the case-hardening and tempering process. Finally, the original purpose of the study was satisfied. Peerless Chain gets colder water at a much lower cost than it ever paid before. **End**

NEW
from
Westinghouse

PRESSURE BLOWERS
WITH AIRFOIL BLADING



only **Westinghouse**

HIGH CAPACITY PRESSURE BLOWERS

have these superior features

1. **EXCLUSIVE AIRFOIL BLADING**
   Lowest horsepower . . . quieter operation
2. **EFFECTIVE INLET CAPACITY CONTROL**
   Stable part load performance . . .
3. **WESTINGHOUSE DESIGNED BLOWER AND MOTOR COMBINATION**
   One source warranty . . .

Use Westinghouse Standard and High Capacity Pressure Blowers for 50 cfm-65,000 cfm, 8 oz. to 36 oz. pressure for combustion air, product cooling, liquid agitation, or process applications.

Call your nearby Sturtevant Division Sales Engineer . . . or, write Westinghouse Electric Corporation, Hyde Park, Boston 36, Massachusetts.

YOU CAN BE SURE...IF IT'S **Westinghouse**

PLANTS AT HYDE PARK, MASS., LA SALLE, ILL., BERKELEY, CALIF.

Watch "Westinghouse Lucille Ball-Desi Arnaz Shows" CBS-TV Fridays

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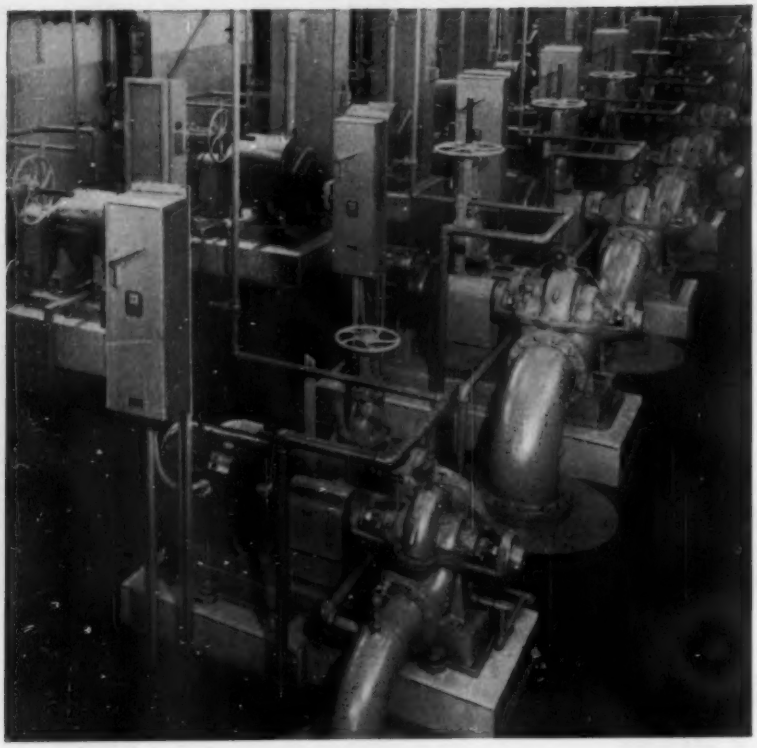

the bigger your pumping problems... the better your reasons for giving them to **WHEELER-ECONOMY**

Ford Motor Company's new Chicago Heights (Ill.) stamping plant had three big pumping problems, and Wheeler-Economy solved them all! Two Double-Suction Pumps keep the plant's reservoirs filled with a million gallons of water. Ten other W-E Pumps are used in Ford's recirculating process water system. And a pair of Double-Suction Pumps supply water for the company's space heating system.

C. H. Wheeler's Engineering Department, and production and test facilities, are all geared to the solution of one-of-a-kind pump problems. See your representative or write direct whenever you need pumps or expert pump advice.

Economy Pump Division

C. H. WHEELER MFG. CO.

19th and Lehigh Avenue • Philadelphia 32, Pa.

Whenever you see the name C. H. Wheeler on a product, you know it's a quality product

Centrifugal, Axial and Mixed Flow Pumps • Steam Condensers • Steam Jet Vacuum Equipment • Marine Auxiliary Machinery • Nuclear Products

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You'll find two postage-free Reader Service Cards on pages 237-238. Use them for ordering product information—just circle item numbers of the products you would like to know more about. You may also use the cards for requesting advertised catalogs.

Machine Flexibility

(Continued from page 120)

time only by the number of operators and the number of tool makers. The company has increased the efficiency and effectiveness of both of these labor functions.

Theoretically, it could be said that their operator's efficiency was increased about 60 per cent. Let us be ultra conservative and allow for variation in productivity of operators and our own ability to manage a shop and compromise on an increase of just 30 per cent in output per operator.

If you say your present output meets sales requirements, then we could express this savings as a per cent of direct labor. Thus, you would expect to earn a 20 per cent reduction in direct labor in your press room and still meet your present output. Again, your dollars are the ones that are important.

For example, you may have 35 presses that could be considered. At 1¾ presses per operator, you would need 20 operators. Let's say they average $3.00 per hour with overhead such as wages, insurance, taxes, supervision, etc. You normally work 20 days per month, so your direct labor per month is $9600 for the 20 operators. Using a conservative 10-month year, this comes to a grand total of $96,000. A 20 per cent savings would total $19,200.

Of primary importance to this particular plant were the tool makers and their capacity to keep the presses going. In the original layout where dies were changed and maintained in the press line, one die setter or tool maker could keep about five jobs running a day. With aids like leveling machinery mounts and setting the job in the tool service preparation area near tools and under more favorable working conditions, this plant raised the average number of jobs from five per day to seven—roughly, a 40 per cent increase in the efficiency of this critical labor function.

Economies resulting from the use of leveling machinery mounts are well recognized by major heavy haulers or machinery movers. Several movers have made time studies to aid them in determining bids when they knew they would be

(Continued on page 224)

Puritan Representative (center) discusses Engineered Maintenance Program with G.E.'s Paul Huska (right) and Earle Holt, General Foreman Building and Equipment Maintenance.

Report from General Electric

"Puritan Engineered Maintenance gives us better organization and control of plant housekeeping"

Puritan representative surveyed G.E.'s plant—came up with tailor-made program.

Training of custodians is part of Puritan's Engineered Maintenance Program.

Regular inspections insure high standards of housekeeping at Pittsfield plant.

"Rapid expansion of facilities and constant construction made it almost impossible for us to maintain the high housekeeping standards our management desired", says Paul Huska, Foreman, Custodial Service, General Electric Ordnance Department, Pittsfield, Mass. "As part of our continuing efforts to upgrade the effectiveness of our service, we turned to Puritan for specialized advice."

"In conjunction with our own methods and standards people, Puritan experts helped us devise a complete and coordinated plant housekeeping program. In addition to organizing the work of each custodian, which, incidentally, boosted staff morale, the program provides for automatic control, inspection, and measurement review."

"The results have been gratifying. Total effectiveness has increased and is continuing to climb. Much of the credit must go to Puritan's knowledge, skill and ideas."

Perhaps you would achieve similar results with a Puritan Engineered Maintenance Program. As a user of Puritan Sanitary Maintenance Products, you get this service free.

Find out how it works. Send today for free booklet, ENGINEERED MAINTENANCE.

PURITAN CHEMICAL COMPANY

EXECUTIVE OFFICES: 916 ASHBY STREET, N. W. ATLANTA 18, GEORGIA
PLANTS AND WAREHOUSES: ATLANTA, GA. • HOUSTON, TEX. • ST. LOUIS, MO.

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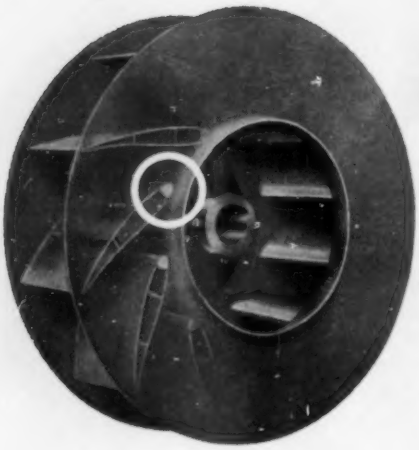
PURITAN CHEMICAL COMPANY
916 Ashby Street, N.W. • Atlanta 18, Georgia
Send me a free copy of your 16-page booklet, ENGINEERED MAINTENANCE.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____



COSTS HELD DOWN WHEN

INLAND®

INCLUDED

Green Airfoil Fans

IN FURNACE REBUILDING

At their #2 plant in East Chicago, Indiana, Inland Steel completely rebuilt and enlarged their furnaces to increase production. These rebuilt furnaces called for greater induced draft capacity in the waste heat boilers. The old fan installation of 7 Green radial blade fans had been installed 24 years ago.

Inland Steel replaced these 7 Green fans with 7 Green AIRFOIL induced draft fans. No changes were made in the original motors or electrical system. The 7 Green AIRFOIL fans took care of the increased draft requirements without overload on the original 125 hp motors.

In short, the new Green AIRFOIL fans made it possible for Inland Steel to increase the size and capacity of their furnaces without the expense of new motors and electrical installations in addition.

The Green AIRFOIL design provides smooth airflow with a minimum of turbulence. For longer life, the AIRFOIL fan blades have specially designed cast steel nose pieces to reduce wear. (See circled nose piece in illustration.)

If you have a tough job for heavy duty fans, it makes sense to talk over your problem with Green.

Green

THE GREEN FUEL ECONOMIZER CO., INC.

BEACON 3, NEW YORK

For more facts circle 634 on Reply Card

Machine Flexibility

(Continued from page 222)

mounting machines on leveling mounts. Resulting bids were 20 to 30 per cent below those which normally would have been submitted if the movers had to bolt and lag machines. Time studies would involve the type of approach shown in the boxed item.

Many companies install and move their own machines. One company chose to keep accurate cost studies when installing machines, and has found an average saving per machine of $54. (This is conservative because the records were maintained over two years ago when a dollar bought more time than it does today.)

Frequently, machinery mounts have cut new building construction costs. Floor slab design generally is conservative and considers both static weight and impact conditions. Naturally, a floor must be thicker, more rigid, and more costly if it is to be subjected to impact.

To summarize: These are benefits obtainable from machine mobility—press installation costs are reduced; direct labor costs are reduced; floor operating area is reduced; press room noise is reduced; die life is frequently increased; machine maintenance is reduced; building deterioration is reduced. **End**

CONSTRUCTION BRIEFS

This series of articles, which has appeared bi-monthly for the past five years, is available in a set of booklet reprints. The first four cost 50 cents apiece, the last one 75 cents . . . for a total of $2.75 for the set.

The first booklet discusses beams, reaction, bending moment, shear, moment of inertia, and section modulus; the second, deflection, horizontal shear, floor loading, framing, columns; the third, columns, trusses, connections, welded connections; the fourth, fastenings for timber and a four-part series on the structural design of an industrial building; the fifth, a seven-part series on designing in reinforced concrete.

For any one, or all, of these "refresher" booklets, address the Editor, Plant Engineering, 308 E. James St., Barrington, Illinois.

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AUTHORIZED PLEXIGLAS DEALERS
are located in these cities:

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Baltimore, Maryland
Boston, Massachusetts
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Detroit, Michigan
Englewood, Colorado
Fort Worth, Texas
Grand Prairie, Texas
Hanover, Pennsylvania
Hartford, Connecticut
Houston, Texas
Indianapolis, Indiana
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Los Angeles, California
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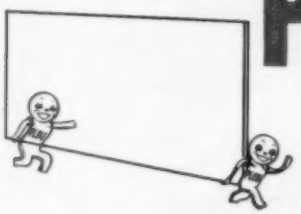

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NEW BOOKS

for the plant engineer

Metalworking

PRACTICAL DESIGN OF SHEET METAL STAMPINGS by Federico Strasser. Size 9½ by 6⅜ in.; 175 pp including index; illustrated; cloth bound. Published by Chilton Company, Book Division, 56th and Chestnut Sts., Philadelphia 39, Pa. Price $10.00.

IN THIS BOOK are discussed metal stamping design factors conducive to production with economy and without trouble. Information in this publication is offered on the details of design and special problems. Processes with which the book deals are not only those that transform sheet metal pieces but also metal slugs into products or components.

Among the topics of discussion in this book are following: bent and formed components; economy of stock in sheet metal stampings; collaboration between product designer and experienced press workers; combinations of machining and press operations; standardization in design of metal stampings; and principles of good stamping design.

The book includes formulas for shell shapes and corresponding illustrations of the various "drawn" items. There are numerous sketches in the book showing different ways of joining metal stampings and many others pertaining to various metalworking operations.

Aluminum Data

ALUMINUM CONSTRUCTION MANUAL. Size 9¼ by 6¼ in. approx; 389 pp including index; cloth bound. Published by the Aluminum Association, 420 Lexington Ave., New York 17, N. Y. Price $3.00 (plus tax in N. Y. City)

THIS MANUAL is divided into five main parts. In part one are tables giving the elements of various sections such as radii of gyration and section moduli. It also contains standard dimensional tolerances for structural shapes, sheet and plate, rods, bars, tubes and pipe. Two examples give details for design of plate girders.

Estimating and detailing items appear in part two. Here can be found weights and dimensions of bolts and nuts; sizes of rivets and their approximate number per pound; weights and minimum spans for allowable uniform loads using standard and seated beam connections; clearances for driving

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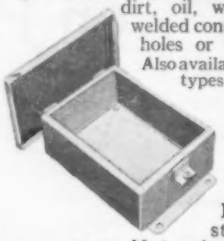

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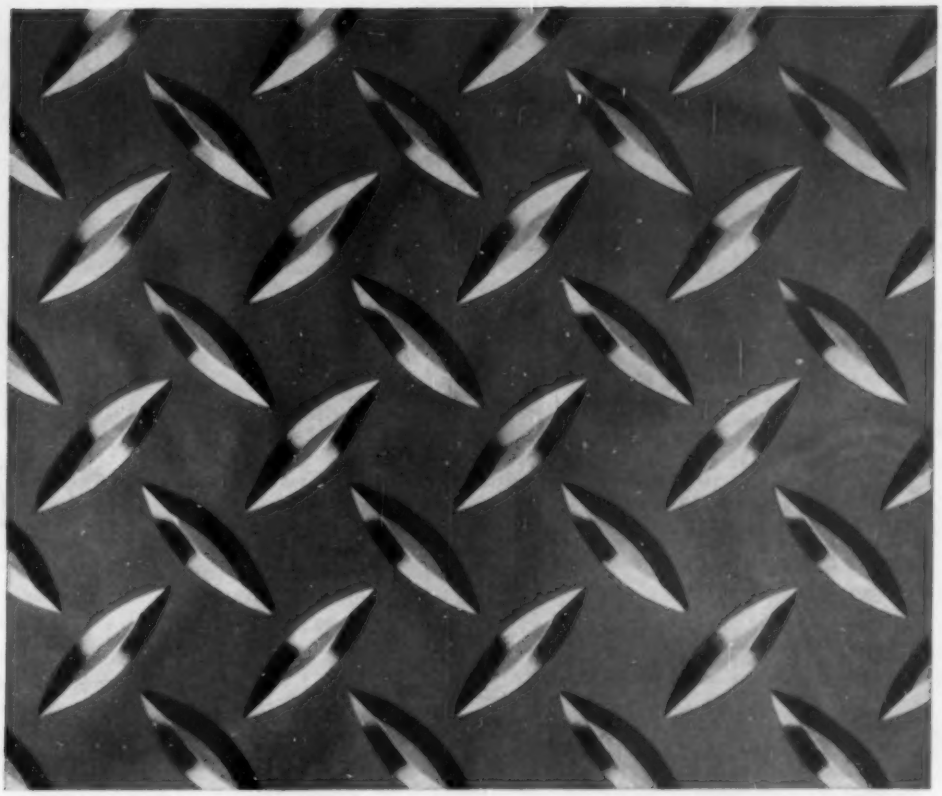

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NEW BOOKS

rivets and hammer dimensions; and other information.

Part three has tables on allowable loads on beams, columns, struts and plates. Specifications are presented in part four covering structure of aluminum alloy 6061-T6, and 2014-T6 along with mechanical property limits of aluminum structural alloys. Some miscellaneous information has been compiled in part five which includes such items as beam formulas, conversion factors, properties of circles, etc.

Fuels and Lubricants

FUELS AND LUBRICANTS by M. Popovich and C. Hering. Size 9¼ by 6⅛ in.; 312 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York. Price $8.50.

PREPARED primarily material for college use, the book contains, however, the kind of information that may be of use to those outside the college student category who do not have an educational background on fuels and lubricants.

It may be well to point out that the major portion of this book relates to fuels as compared to treatment pertaining to lubricants.

Coal, a familiar type of solid fuel is discussed at the beginning of the book with comments on heating value and proximate analyses. In the chapter dealing specifically with gaseous fuels the book includes brief treatments of: natural gas, L.P. gases, producer gas, and other kinds of gases.

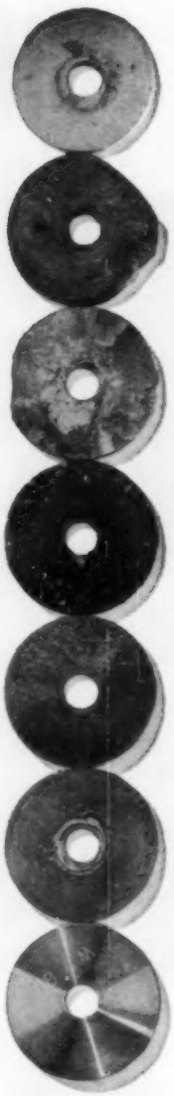
The following are topics of some of the thirteen chapters in the book: refining of petroleum; gasoline; distillate and residual fuels; greases and solid lubricants; rocket propellents; and energy from nuclear fuels.

Near the book's index there is an extensive syllabus on tests on fuels and lubricants listing: purposes of tests; ASTM and Federal Standard methods to use; test materials; and summaries of test methods.

Power Plants

STEAM POWER PLANTS by C. D. Swift. Size 9¼ by 6⅛ in.; 491 pp including index; illustrated; cloth bound. Published by Mc-Graw-Hill Company, Inc., 330 West 42nd St., New York, 36, N. Y. Price $11.50.

DISCUSSION in this book encompasses the design and construction stages of the steam plant and delves into starting, personnel organization,



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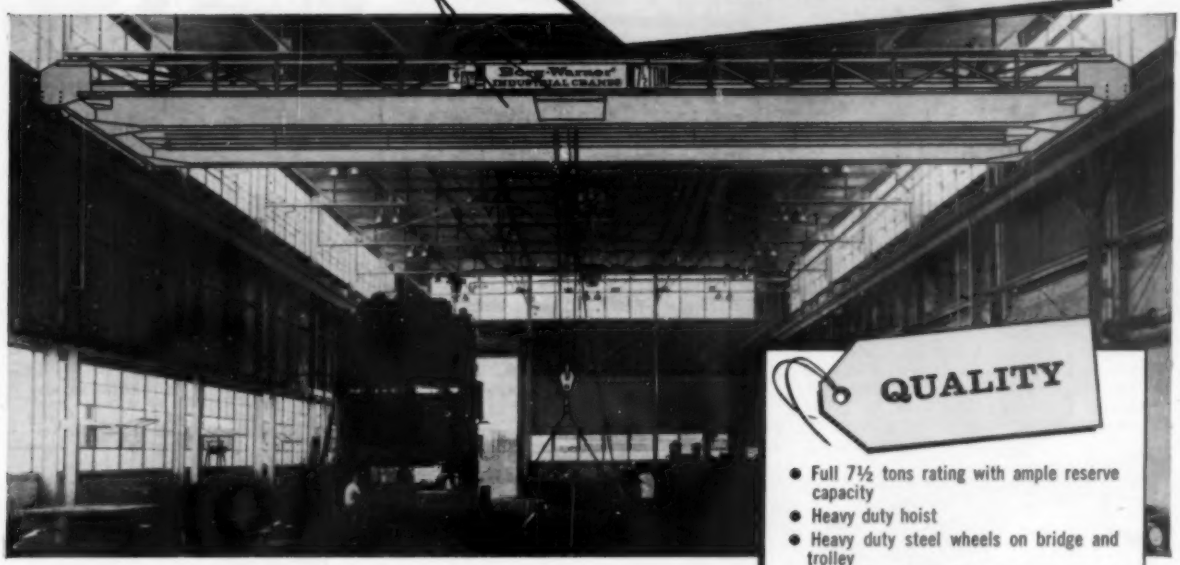

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NEW BOOKS

operating procedures, and acceptance and economy tests. There are also comments on such subjects as turbine types, boilers, auxiliaries, water treatment, maintenance, cooling towers and ponds, and the electrical systems.

A sample layout and check list is provided of items for consideration in planning a new steam plant. The check statements pertain to the following: fuel handling; storage and preparation; water and water treatment; condenser and cooling water system; condenser and auxiliaries; turbine-generator; boiler; piping; pumps; heaters; miscellaneous equipment; electrical; instruments; and controls.

Lamps and Lighting

PRIMER OF LAMPS AND LIGHTING by Willard Allphin. Size 9½ by 6¼ in.; 241 pp including index; illustrated; cloth bound. Published by Chilton Company, Book Div., 56th and Chestnut Sts., Philadelphia 39, Pa. Price $10.00.

This book should be a helpful source of information for people who do not specialize in lighting technology but are concerned enough with lighting that they would like to know more about it. Among these are plant engineers, electrical foremen, and electricians.

Starting with a chapter on some electrical fundamentals of a general nature, the book continues with discussions of light and related terminology, taking in the photometry of fixtures.

Remarks on characteristics of incandescent lamps follow; some answers to complaints on this type of lamps are included. Other principal topics of discussion are as follows: fluorescent lamps and their characteristics, mercury vapor lamps, light meters, lighting principles and calculations, lighting layout and lighting in the home.

A lighting slide rule is offered with the book along with instructive matter on its use including several examples. The book also contains a list of lighting levels of a variety of industrial applications.

Want Tear Sheets?

If you would like tear sheets of any articles appearing in this issue, just drop a line to The Editor, Plant Engineering, 308 East James St., Barrington, Ill.

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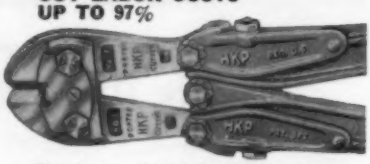

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The 16 mm films are mounted on one 2000-ft reel. Films are loaned free, with postage paid both ways. For further information write to Rothacker, Inc., 729 Seventh Ave., New York 19, N. Y.

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The film has been produced particularly for the benefit of any group or individual whose work involves the care and handling or replacement of any of the five basic types of ball and roller bearings used to control motion and alignment in motor vehicles.

Each of the four parts of the film runs about 20 minutes. Part I contains basic information on the design features of the five types of bearings. Part II explains and illustrates basic rules for handling bearings.

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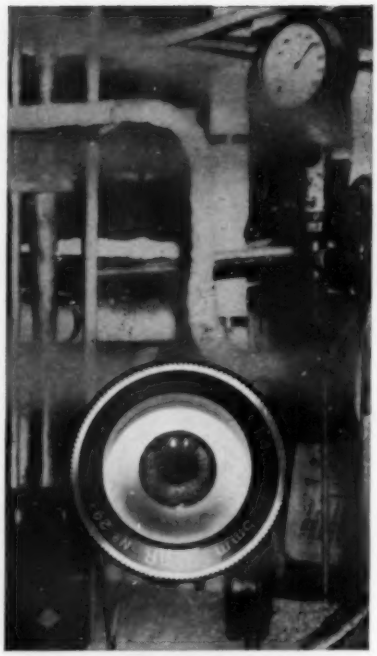

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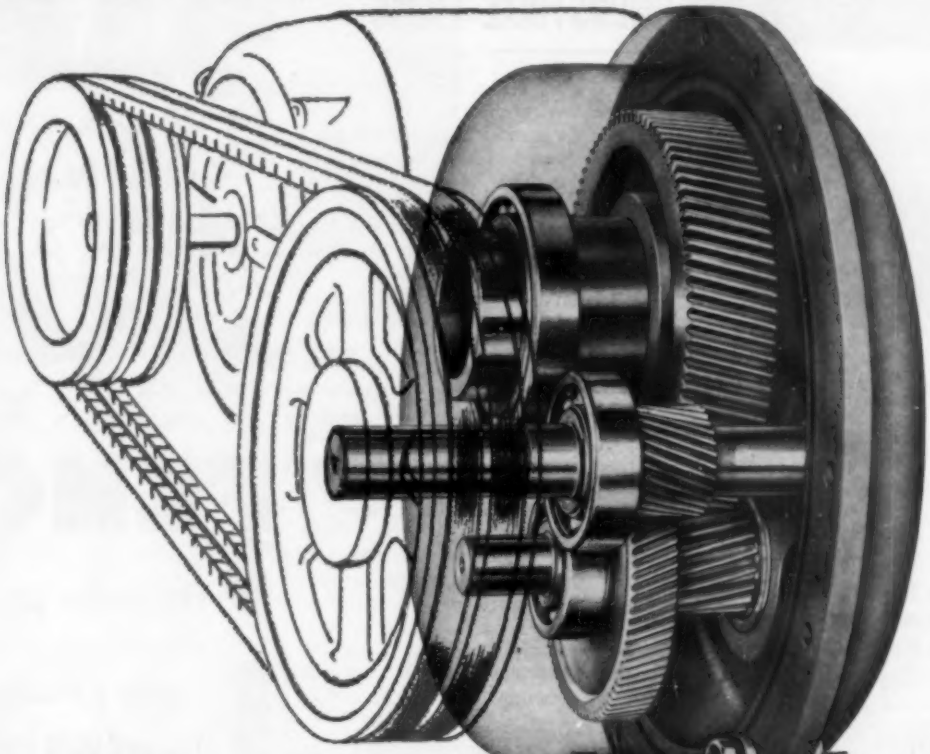

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- ☐ universal worm gear speed reducers—Catalog 2724
- ☐ parallel shaft speed reducers—Catalog 2619
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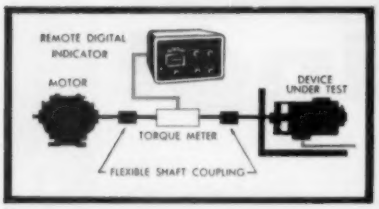

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INDUSTRIAL FILMS

based on the design and manufacture of receiving tubes.

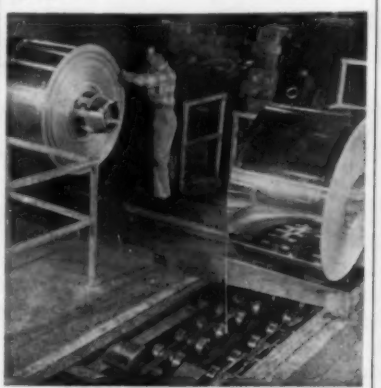
The film is more than a plant tour. It tells about a young engineer and a pretty instructor in charge of training new operators whose job is to show the engineer some of the fundamentals of receiving tube manufacturing.

The film in effect tells the story of 7000 employees of General Electric Company's receiving tube department. Principal roles are played by professional actors, but the extras in the picture are the men and women in the receiving tube plants in Owensboro, Ky., Tell City, Ind., and Anniston, Ala.

The film is available to manufacturers, engineers, schools, radio clubs, professional societies, libraries and others for showing in educational and sales training programs. It runs about 40 minutes. Write to General Electric Company, Receiving Tube Department, Owensboro, Ky., for further information.

Materials Handling

"HANDLING MATERIALS in the Steel Industry," shows the wide range of equipment used in steel making.



The film shows the gathering and crushing of ore, the mining and preparation of coal for the production of a strong, hard coke for blast furnaces and open hearths. The handling of steel coils through the various processing operations to final shipment plays an important part in the film. Three different installations are shown and include hot coil handling on down-tilters from the coilers, through cooling, into storage and reclaiming.

The film is available without cost on letterhead request for showing in the U. S. Write to Public Relations Department, Link-Belt Company, Prudential Plaza, Chicago 1, Illinois.

PAGE

FENCE

Fence value depends on
—quality materials
—quality installation
You get both from PAGE

New Aluminized Fabric!
(other quality fabrics available: galvanized steel, aluminum, stainless steel)

8 basic fence designs
6 gate styles

Expert installation by specialists

Registered Certificate of Quality furnished to property owner

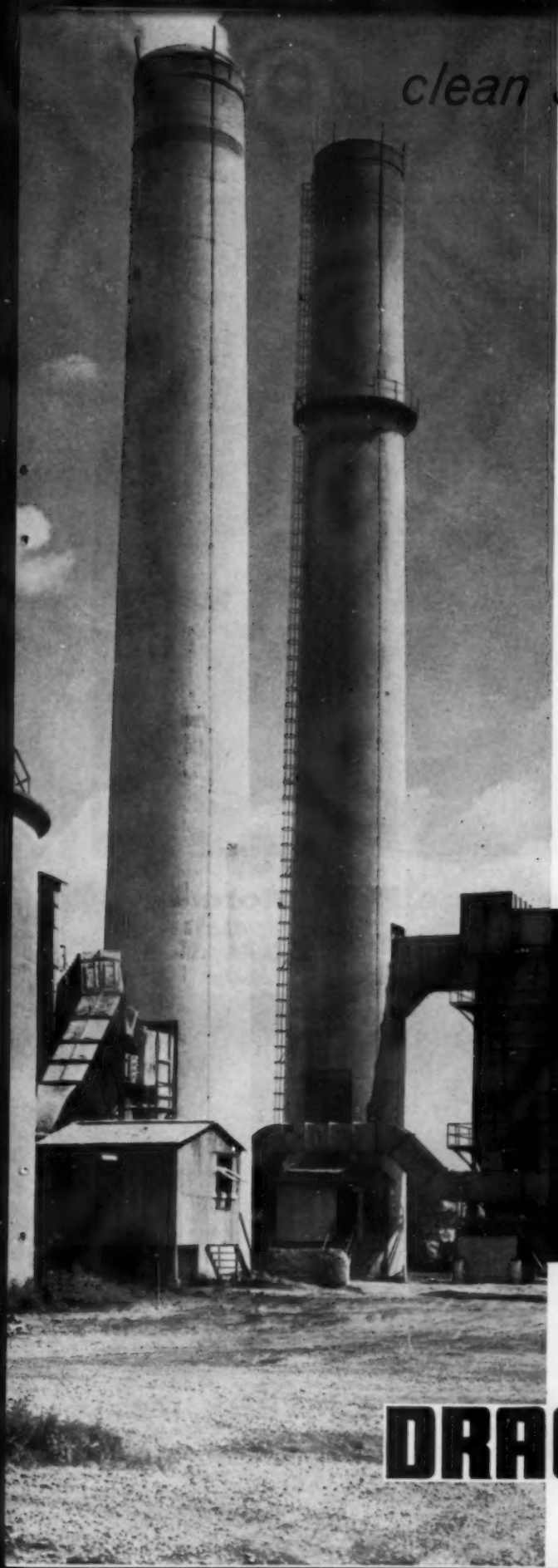
Good fences—since 1883

Write for helpful booklet

PAGE FENCE ASSOCIATION
National Headquarters • Monessen, Pa.

A product of Page Steel & Wire Division American Chain & Cable Company, Inc.

For more facts circle 649 on Reply Card



clean stack at Dragon Cement!

DRACCO GLASS-BAG FILTER HALTS AIR POLLUTION BY COLLECTING KILN DUST AT 600° F.

The unretouched photograph shows the dramatic result produced by a Dracco Glass-Bag Filter at Dragon Cement Co., division of American-Marietta Co., Northampton, Pa.

The kiln is running at full capacity—but no visible dust is escaping from the stack connected to the Glass-Bag Filter. The filter is collecting the extremely fine dust with virtually 100% efficiency. Duplicate equipment has been ordered to eliminate visible dust from the other stack.

Convinced that this is the best answer to air pollution from kiln stacks, Dragon has ordered three more Glass-Bag Filters. Soon all stacks will be clean at Dragon!

Exclusive dust removal techniques assure extra-long bag life. At Dragon, Dracco's patented SONOCLEAN unit safely cleans the bags with sonics. Sound waves gently dislodge dust without wear or fracture of the cloth.

Modular, compartmented design gives flexibility to meet any capacity requirement and simplifies servicing. Worker comfort during servicing is assured by interior insulation.

Dracco Glass-Bag Filters, the first successful glass cloth collectors, are now collecting hot, corrosive dust and fumes in many industries—cement, chemical, metallurgical. Gases to 600° F. can be introduced into the filter where specially treated glass bags retain all visible dust.

Seven-compartment 50,000-cfm Glass-Bag Filter assures dust-free kiln effluent. Sonic cleaning of glass bags is unique feature of high-performance collector.

For further information on Glass-Bag Filters, today's most advanced equipment for air pollution or hot dust problems, contact: Dracco Division of Fuller Company, Harvard Avenue and E. 116th Street, Cleveland 5, Ohio.

DRACCO *airstream* conveyors
dust control equipment

FULLER COMPANY

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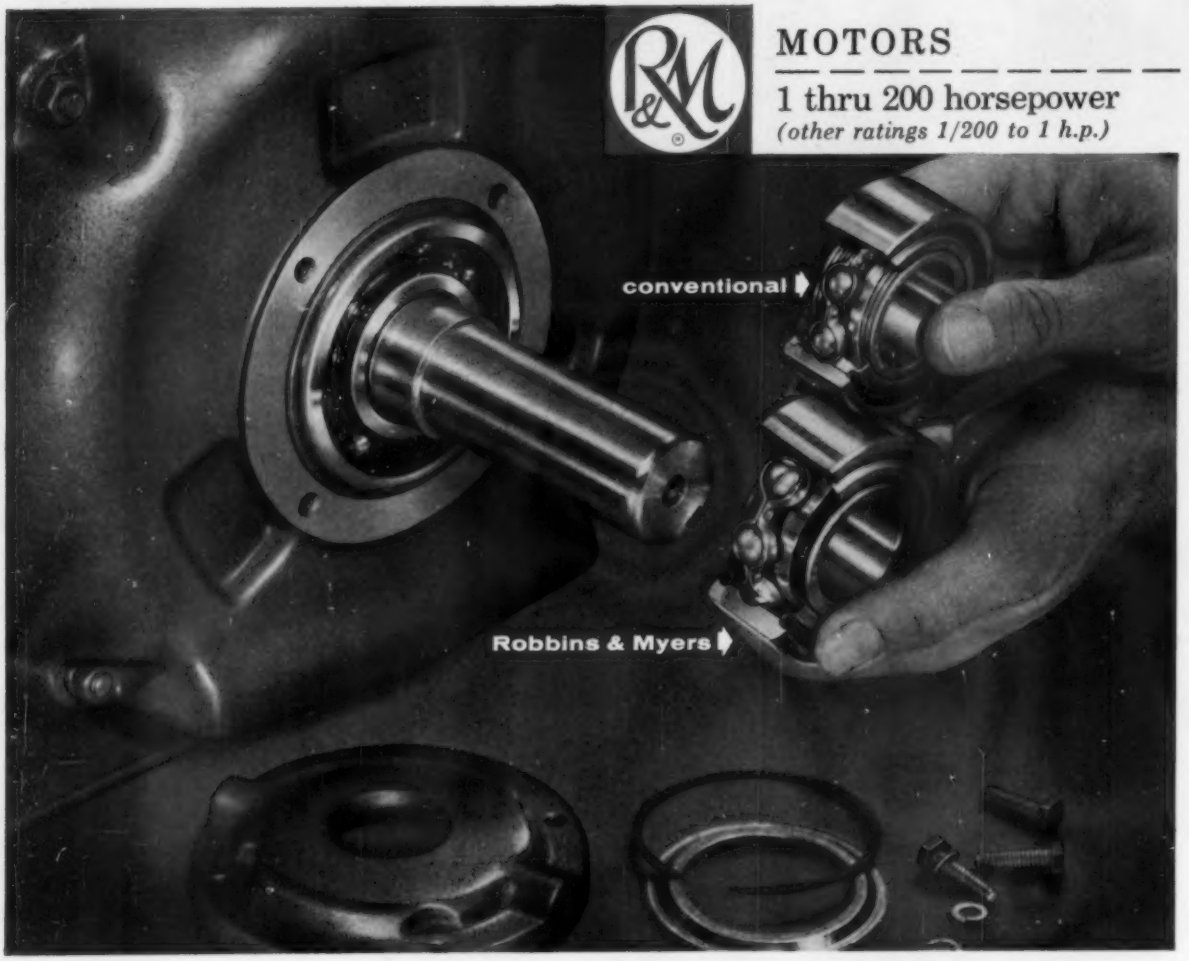


R&M

MOTORS

1 thru 200 horsepower

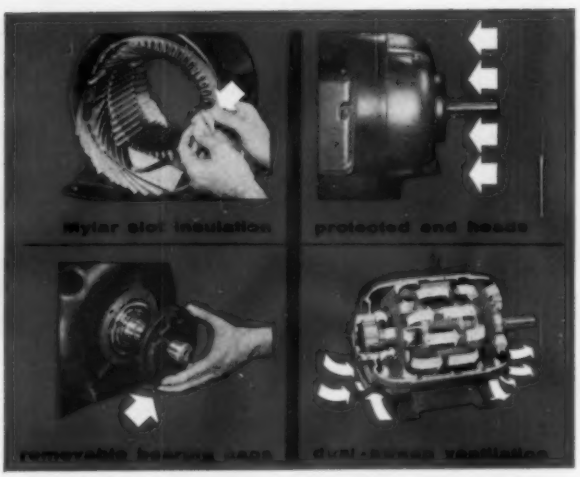
(other ratings 1/200 to 1 h.p.)

Double Width Bearings Hold More Grease...*Insure Longer Motor Life!*

Bearings in ROBBINS & MYERS motors run in double-width races with extra-large lubricant reservoirs. Bearings are fully sealed and pre-lubricated with laboratory tested grease which resists dust, temperature, humidity and high operating speeds. Tests prove these bearings can withstand six to nine years of severe service without relubrication. Bearings are further protected by metal seals on each side. Seals keep impurities out, prevent failure caused by "forgotten" lubrication or damaging over-lubrication.

R&M insures longer motor life with many additional features: Mylar* insulation that has 8 times the dielectric strength and 35 times more moisture resistance than ordinary paper insulation . . . removable caps for quick bearing inspection and relubrication . . . end heads that give full-height protection . . . dual-sweep ventilation for efficient cooling. For details, write today for Bulletin 520 PE

**DuPont registered trademark*



ROBBINS & MYERS, INC.

motors, household fans, Propellair industrial fans, hoists, Moyno industrial pumps

SPRINGFIELD, OHIO • BRANTFORD, ONTARIO

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BULLETINS

(Begins on page 19)

controls, including automatic temperature, pressure, level and flow controls, as well as counters, switches and automation controls. Other items illustrated and described are industrial actuators, combustion instrument controls, controller indicators and others. General Controls Co.

145 Temperature Controls—Filled with charts, drawings, and diagrams, 24-pp Bulletin 101 discusses industrial temperature measurement control, including ways of responding to temperature, ways of putting temperature response to work, mercury-bulb instrumentation, basic types of controls, and a score sheet for the mercury-bulb system. Also covers basic concepts of electrical, pneumatic and mechanical controls. The Partlow Corp.

146 Recorders, Control Stations—Specifications FS301-8 describes recorders and recording control stations which continuously indicate and record the standard 4-20 ma d-c output of any ElectriK Tel-O-Set transmitter or transducer. Specifications, dimensions and features are covered. Industrial Div., Minneapolis-Honeywell Regulator Co.

147 Explosion-Proof Controls—Advantages of company's explosion-proof controls, indicating, non-indicating and recording, are detailed in this product bulletin. Design features and ratings given. The Partlow Corp.

148 Transmitting Rotameters—Bulletin 18N describes the pneumatic, Model 58, a position-balance type instrument transmitting air signals proportionately to fluid rates of flow to remotely-located indicators, recorders, controllers or integrators. This transmitter is mounted directly on and coupled to the rotameter to sense rotameter-measured fluid rate of flow. Photos, drawings, characteristics, dimensions, ranges, construction, operation, and applications are included. Schutte & Koerting Co.

149 Rugged Rotameters—Bulletin 150 gives details of materials used in manufacturing rotameters for corrosive applications. Various types of field-tested meter designs are illustrated and described in detail. Brooks Rotameter Co.

150 Electronic Instruments—This 32-pp catalog illustrates and describes instruments for electronic, biological and chemical measurement and control. Specifications and performance data included, as well as schematic diagrams and application circuits, and basic information on electrometers and micro-micro-ammeters. Keithly Instruments, Inc.

151 Mercury Thermostats—Catalog 684, 18-pp, describes the Vap-Air standard mercury thermostats. Also describes three standard merc thermostat groups; well-type for sensing case temperature, duct-type for gas or fluid temperature sensing, and surface type for "area contact" temperature sensing. Vap-Air Div., Vapor Heating Corp.

152 Motion Indicator—Described in Bulletin RG-21 is a positive motion indicator, a machinery safeguarding mechanism designed to convert rotary motion into an electrical signal. Specifications, ordering instructions, and installation data included. The Bin-Dicator Co.

153 Predetermining Counters—Mechanical, electromagnetic and photoelectric counters incorporating the pre-determining feature are illustrated and described in Form 227773. Features and advantages of various types of counters are detailed. Veeder-Root Inc.

154 Machine Tool Control—Advantages of numerical positioning control are outlined in this 8-pp bulletin. Describes features of the machine tool control, operation details, tape preparation and production, and includes specifications. Industrial Systems Div., Hughes Aircraft Co.

AUTOMATION

155 Data Collecting System—This 18-pp booklet describes the Friden Collectadata, a data collecting system which automatically channels information from numerous work stations to a central processing point. Covers equipment involved, applications for the system, benefits afforded. Systems diagram included. Friden, Inc.

156 Computers, Accessories—Descriptions of general and special analog computers and accessories are given in this brochure. Computers with 80 and 120 amplifiers, electronic multipliers, data plotting boards, linear programming computers and a computer technology, the Dystac system are included. System incorporates iterative capability of digital computers while maintaining the speed and ease of analogs. Computer Systems, Inc.

157 Pre-Engineered Servo Systems—Bulletin 59-75 describes advantages of the "building block" concept using standard hydraulic and electrical components pre-engineered into servo systems. Typical applications are noted. Vickers Inc., Div. Sperry Rand Corp.

158 Servo System Simulator—Servo Design Report SDH-2, 6-pp, explains application of the Servolab, to design of control systems for industrial process controls, others. Equipped with a block schematic, screwdriver and Servolab, you can stimulate complete or partial servo loops, without programming or fabrication of intermediate prototypes. Illustrations show the Servolab packaged assembly of electronic and electromechanical components, and text tells how this versatile synthesis and analysis system solves complex servo problems quickly. Servo Corp. of America.

SAFETY, FIRE PROTECTION

159 Fire Alarm Systems—Publication 246 contains 36-pp of detailed information on fire alarm systems for critical applications in industrial, institutional and other public buildings. Contains typical job specifications covering all systems. The Standard Electric Time Co.

160 Fire Extinguishing Equipment—Featured in 20-pp Catalog 1960 is a complete line of fire fighting equipment, including hand portable extinguishers, stationary fire equipment, piped systems, and large capacity mobile equipment such as fire jeeps and trucks. Capacity data on various types of fire extinguishers and other equipment are presented. Ansul Chemical Co.

WELDING AND MACHINE SHOP EQUIPMENT

162 Manual Welding Equipment—Illustrated and described in 20-pp Catalog F-8982E is manual welding equipment using an inert gas to protect the weld zone from the atmosphere. Various types of welding torches and accessories suitable for welding of all commercial metals are covered. Linde Co., Div. Union Carbide Corp.

163 Welding Electrodes—Eight-pp Bulletin A-1 describes successful applications of welding electrodes and wires in a variety of industries. Performance results and economies are detailed. The McKay Co.

Reader Service Cards for ordering bulletins are on the facing page. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

164 Electrode Handbook—The 64-pp Electrode Pocket Guide contains information on all types of welding electrodes, including mild steel, low alloy, low hydrogen, iron powder, stainless steel, hardfacing, nonferrous and cast iron. Covers applications, procedures and pertinent data on each electrode, and includes charts of recommended electrodes for welding various steels, and comparison tables for mild steel and hardfacing electrodes. Air Reduction Sales Co., Div. Air Reduction Co., Inc.

165 Guide To Preheat—Welding of low-alloy high-tensile steel and other alloy steels with the aid of preheat is explained in 40-pp "A Guide To Preheat." Physical and chemical changes that take place in these problem steels during and immediately after welding are outlined. J. B. Nottingham & Co., Inc.

166 Band Machines—Described in this 8-pp catalog is the Zephyr line of high-tool-velocity band machines. Applications, design details, specifications and attachments are covered.

BULLETINS

(Begins on page 19)

Zephyrs have 36-in. throats, 20-in. work height, offer great versatility. Catalog illustrates 16 examples of use, including making automotive mufflers, snagging castings, notching paper boxes. Modifications are also shown, including a track mounted Zephyr for cutting off aluminum billets. The DoAll Co.

167 **Boring, Grinding Machines**—General Catalog 1-2, 16-pp, describes basic design features of company's machines and covers various models of Bore-Matics, internal grinders, rotary surface grinders, tool sharpeners, boringheads and wheelheads and attachments. Includes illustrations and specifications for each model. The Heald Machine Co.

168 **Products for Tooling**—Plastic Steel and other products for making tools, jigs, fixtures, metal forming dies, molds, and masters for duplicating are described in 8-pp Bulletin 2. Typical applications are illustrated in case-history form. Devcon Corp.

169 **Tips on Die Protection**—Practical ways to protect machine tool dies are described in these five "how to" idea sheets. They offer low cost ways to prevent damage to tools and dies with precision switches, each showing how a switch can be incorporated into the design of a die to assure proper operation. Diagrams and construction details provided. Subjects covered include use of a switch to detect misfeed of material, prevent die smash-up, prevent pile-up. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

WATER CONDITIONING

170 **Sodium Zeolite Softeners**—Described in 12-pp Bulletin 4520 is the sodium zeolite process of water softening. Includes information on selecting and sizing of equipment, automatic vs manual controls and calculations of softening capacity. Cochrane Corp.

171 **Demineralization Process**—This Bulletin 5819 describes Uni-Pac, a packaged mixed bed demineralizer for process water applications ranging up to 13,200 gph. Information on use of process eliminating variables in water and effects on product quality control given. Cochrane Corp.

ELECTRICAL

172 **Drip-Proof Motors**—Bulletin 196 gives details on the Sterlicone Multi-Shielded drip-proof motor and illustrates design features. Explains how these motors can be used in many applications where adverse conditions of moisture, humidity, dust, oil and chemicals prevail. Sterling Electric Motors, Inc.

173 **Electric Motor Controls**—Contained in 72-pp Catalog 5900 are selector charts for magnetic and manual starters, giving horsepower, motor speed, heater size, heater ampere ratings, enclosure choices, along with style numbers and list prices. Covers manual starters, magnetic controls, drum controllers, pressure switches, accessories. Furnas Electric Co.

174 **Stored Energy Breakers**—Low voltage stored-energy power circuit breakers are discussed in a 20-pp Bulletin GEA-5915E. Includes photographs, diagrams, graphs, charts showing specifications, operating features, dimensions, ratings for low voltage power circuit breakers and applications. Manual and electrical stored-energy closing mechanisms are described in a range of ratings through 600 v, 4000 amp. General Electric Co.

175 **Molded Case Circuit Breakers**—Illustrated 40-pp Bulletin 5091-1A contains ratings, specifications and operating characteristics on a diversified line of molded case circuit breakers. Pictures and describes molded case circuit breakers ranging from the smallest for lighting circuit protection, through 100,000-amp capacity breakers, special-purpose types. I-T-E Circuit Breaker Co.

176 **Improved Meter-Relays**—Features and advantages of company's expanded scale meter-relays are illustrated and described in this product bulletin. Circuitry data and diagrams and specifications are included. Assembly Products, Inc.

177 **High Frequency Duct**—This 12-pp Booklet B-7326 describes high-frequency bus duct, outlines features and contains a curve of voltage drop at 400 cycles per sec plotted against load. Also included are: fittings, dimensions, ratings and specifications. Westinghouse Electric Corp.

178 **Tungar Bulb Data**—Eight-pp publication ETR-2091, a revised edition of company's manual on Tungar bulbs, contains typical circuits and operating data. Also provides descriptive and theoretical data on use of Tungar bulbs in rectifier circuits to provide noise-free power supplies with low voltage drop and high overall efficiency. Electronic Components Div., General Electric Co.

179 **Silicon Rectifiers**—Eight-pp Bulletin 6101-1A contains details on the Unitron, a unified power conversion system consisting of a silicon rectifier unit, transformer and associated auxiliary equipment. Design features which permit a wide range of applications are detailed. I-T-E Circuit Breaker Co.

180 **Silicon-Rectifier Chargers**—Technical data on constant-voltage, silicon-rectifier chargers for stationary-type batteries are presented in Data Sheets Section 90.41, 90.44, and 45. Includes curves and statistics on charger performance at various electrical loads, data sheets also contain diagrams and instructions for installing associated alarms and ground detection systems. Exide Industrial Div., The Electric Storage Battery Co.

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181 **When Lights Go Out**—Features and advantages of emergency lighting units with automatic battery charging are detailed in this 8-pp bulletin. Specifications are included, as well as data on dimensions and applications. Electric Cord Co.

182 **Retractile Cords**—Features and applications of company's line of retractile cords are illustrated and described in 16-pp Catalog 582. Detailed selection tables for applications in communication and industry are included. Koiled Kords Inc.

METAL FINISHING

183 **Steel Shot**—Factors to be considered in selection of steel blast cleaning abrasives are outlined in 20-pp Booklet 2294. Features which make one brand of abrasive better than another are graphically presented along with photos showing how poor quality shot can prove costly. Pangborn Corp.

184 **Blast Cleaning Abrasives**—Bulletin 903-D contains 20-pp of helpful information on economy and performance of blast cleaning operations as determined by the type of abrasive used. Contains statistical data on abrasive selection and detailed specifications on company's steel abrasives. Wheelabrator Corp.

PROCESSING EQUIPMENT

185 **For Process Industries**—Twelve-pp Bulletin G-3C discusses applications and performance characteristics of pumps, pneumatic conveyors, fluidizing conveyors, rotary compressors and vacuum pumps, horizontal-grate coolers, suspension-type preheaters, positive pressure blowers and gas pumps, and induced draft fans. Operating principles are explained and photos show typical installations. Dimensions and capacity data included. Fuller Co.

186 **Air Processing Equipment**—Bulletin S-5 contains 12-pp of data on such equipment as ovens, dryers, air heaters and curing systems for use in pulp and paper, paint finishing, rubber and foam rubber, foundries, plastics and chemical processing. Case histories of tough drying or curing problems are given. J. O. Ross Engineering, Div. Midland-Ross Corp.

187 **Vibrating Dryers, Coolers**—Comprehensive 32-pp Catalog 953 covers electric and mechanical vibrating coolers and dryers of the direct and indirect type. Includes sections on the basic drying principles and the TMV variable amplitude unit, as well as specifications, material weight charts, drawings and photos. The Jeffrey Mfg. Co.

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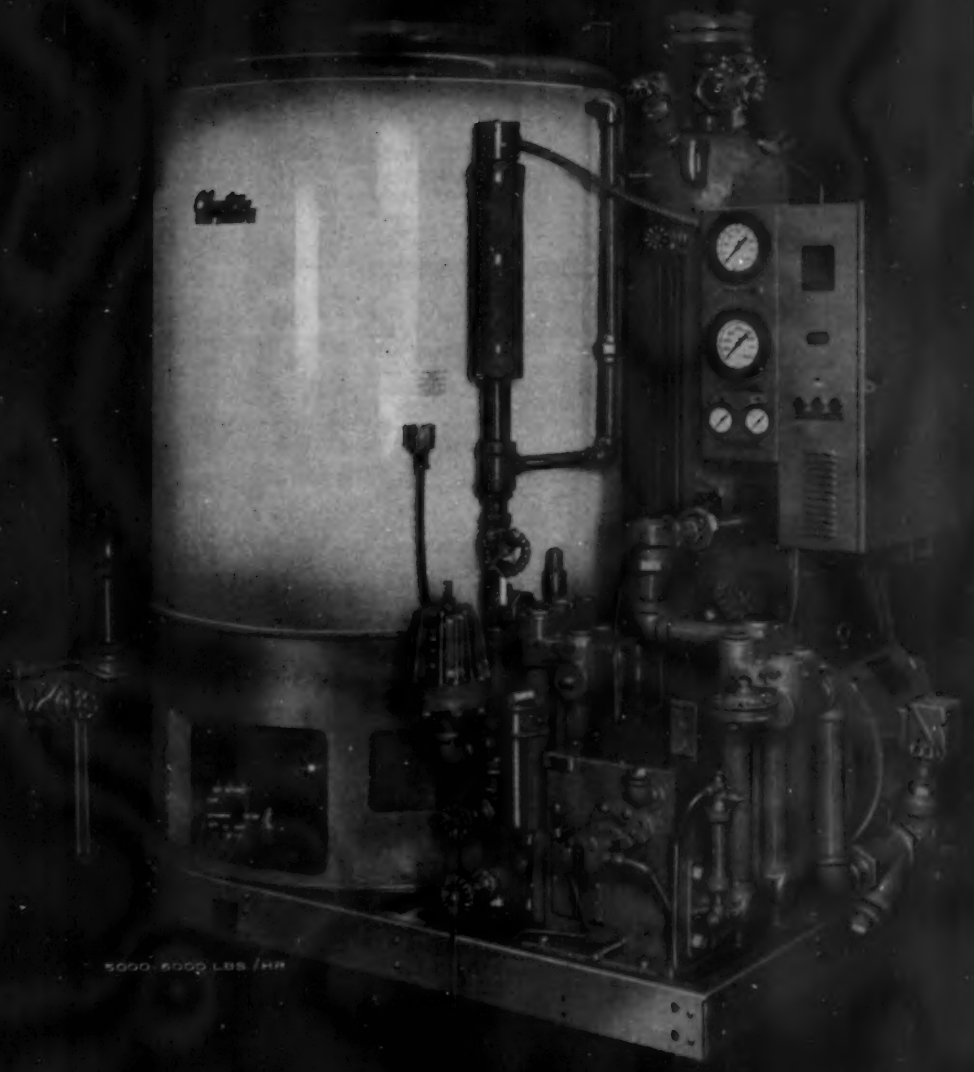

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BULLETINS

(Begins on page 19)

188 Economical Electric Screens—Operating principles and application of electric screens which have no bearings, require no lubrication, and have low power requirements, are detailed in 24-pp Catalog 83. Dimensions and recommendations are included. The W. S. Tyler Co.

OTHER EQUIPMENT

189 Coil Selection Guide—Information on water and direct expansion refrigerator coils is given in 28-pp Catalog 5559. Provides selection data on water heating and cooling coils; physical and performance charts; mean effective temperature difference charts. Explains determination of final dry bulb temperatures and direct expansion coil surface temperatures. Also includes direct expansion cooling coil capacity tables, psychrometric chart, total heat table, dimensions, piping diagrams, architectural and engineering specifications. Young Radiator Co.

190 Steel Equipment—A wide range of steel equipment is illustrated and described in 92-pp Catalog 100 H, including desks, tables, cabinets, filing cabinets, coat racks, stools, shop desks, tool boxes, work benches, tool stands, bin units, revolving bins, shelving, etc. Design and construction details are illustrated, dimensional data given, and applications shown. Lyon Metal Products, Inc.

191 Compressed Air Products—Color-coded for easy product identification, 24-pp Catalog 158 contains comprehensive information on company's compressed air products, including filters, regulators, lubricators, drains and accessories. Detailed specifications are given, along with photos, drawings, and schematic diagrams. Wilkerson Corp.

192 Water Tube Boilers—Catalog SB-57R contains 20-pp of detailed information on company's two-drum water tube factory assembled boilers. Sectional views, dimensional drawings and mechanical data on the oil, gas or coal-fired units included. Erie City Iron Works.

193 Corrosion-Resistant Seal—Information and engineering data on a corrosive service shaft seal made of Teflon and designed to handle all concentrations of acids and salts, strong oxidizing or reducing agents and organic compounds are contained in Bulletin S-233. Table of operating pressures and temperatures and dimension tables are included. Crane Packing Co.

194 Plate Heat Exchanger—This 12-pp brochure describes plate heat exchangers for use in small plants, medium size plants and high capacity plants. Features and advantages are detailed. De Laval Separator Co.

195 Instant Hot Water—Described in this product bulletin is a heater package designed to give accurately controlled hot water under varying loads. Table of heating capacities is included. Fulton Sylphon Div., Robertshaw-Fulton Controls Co.

196 Tar Base Enamels—Selection and application of hot applied tar base enamels for underground pipelines is covered in this 16-pp product bulletin. Enamel and primer data are provided. Pittsburgh Coke & Chemical Co.

197 Cathodic Protection System—Causes of corrosion and principles of cathodic protection are detailed in this 12-pp bulletin. Covers cathodic protection for pipe lines, water works equipment. The Harco Corp.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 237 and 238.

PUMPS AND COMPRESSORS

301 Continuous Flow Pump—Bulletin 30-C, 8-pp. outlines advantages of company's Moyno pumps which handle a variety of moterials —from free-flowing liquids to nonpourable pastes, abrasives, solids. Describes principle of operation, discusses performance, construction, capacities, specifications. Robbins & Myers, Inc.

302 End Suction Pumps—Described in Bulletin 158 are horizontal shaft, single stage, and suction pumps designed for handling abrasive mixtures and slurries, as well as corrosive and hot liquid. Various models in the line are described as to design and application. Nagle Pumps, Inc.

303 Single Suction Pumps — Ball bearing single suction pumps are illustrated and described in 24-pp Bulletin 976-H. General data and specifications are included, as well as rating tables, outline dimensions, sectional reference drawings. Buffalo Pumps, Div. Buffalo Forge Co.

304 Centrifugal Pumps—Catalog A-156 describes and illustrates company's line of double-suction single-stage centrifugal pumps. Features are detailed, and cross section drawing and construction details are included. C. H. Wheeler Mfg. Co.

Centrifugal Pumps—Two-stage centrifugal pumps designed for a wide range of heavy-duty pumping applications are illustrated and described in 16-pp Bulletin Form 7062-D. Details of impeller design and arrangement are illustrated with cross sectional views, and tables of performance charcteristics are included. Ingersoll-Rand Co.

306 Alloy Metal Pumps—Recent additions to company's line of alloy metal pumps for hot or cold corrosive and slurry service are illustrated and described in a series of product bulletins—Bulletins 5005 through 5030. Includes performance curves, cross sectional diagrams, dimensional data and detailed specifications on all pumps. Dorr-Oliver Inc.

307 Liquid Pumps—Heavy-duty liquid pumps for pumping paints and inks as well as other abrasive liquids are described in Data Sheet SP-507. Features are illustrated and dimensional data and specifications included. Viking Pump Co.

308 Pumps for Corrosives—Bulletin 725.2 contains 12-pp of data on a line of centrifugal pumps designed for handling corrosive liquids in the chemical process and allied industries. Sectional view showing internal parts is included, as well as specifications, performance curves and dimensional data. Goulds Pumps, Inc.

309 Industrial Compressors—Oil-free heavy-duty industrial compressors are illustrated and described in 12-pp Bulletin A-92. Cutaway views show details of internal design and construction, and bulletin includes photos of typical installations, specifications and other data. Joy Mfg. Co.

310 Water-Cooled Compressors—Featured in 12-pp Bulletin WB10 are two-stage water-cooled air compressors designed to meet the demand for small machines having efficiencies comparable to those of large two-stage horizontal compressors. Cutaway views showing component features are included, as well as general data tables. Gardner-Denver Co.

311 Unit-Type Compressors—Again available to power engineers is 12-pp Bulletin SG-2 on unit type compressors. Illustrated in color, this bulletin uses photos and cutaways to describe single- and two-stage compressors from ½ to 15 hp, available pressures from 80 to 250 psi. Specifications list cfm displacements, pressures, weights, dimensions and rpm. Also covered are parts and accessories. Air receiver and auxiliary storage tank specifications included. Le Roi Div., Westinghouse Air Brake Co.

312 Multi-Stage Compressors—Bulletin 150, 64 pp., presents company's multi-stage centrifugal compressors in both horizontally-split and vertically-split types. Advantages, construction features and application of

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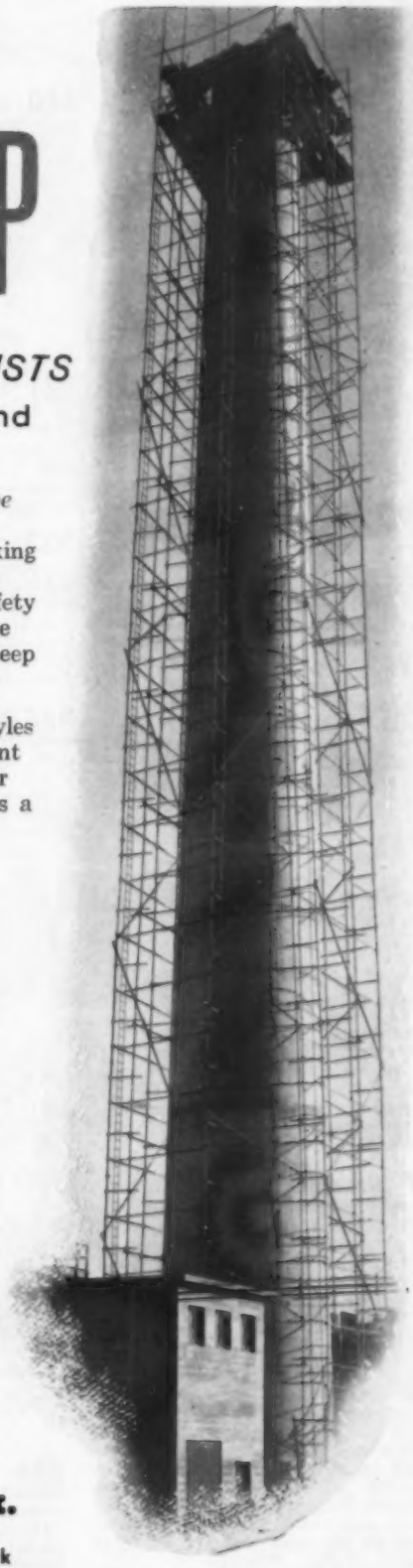

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DATA FILE

(Begins on page 242)

each type are covered, and text is illustrated with photos and cutaways. A section of general information discusses fundamentals of centrifugal compressors and drivers for them. Clark Bros. Co.

313 Stationary Compressors—Sixteen-pp Catalog 5910 describes features and advantages of a line of stationary air compressors designed for a variety of industrial needs. Tables of weights, code words, and dimensions are included, as well as schematic diagrams, cutaway views showing design details, and other data. Schramm, Inc.

PACKINGS, SEALS

314 Metal Packing—Featured in 24-pp Form AD-166 is detailed information on selection of metal packings for use wherever gas or air is compressed or expanded. Covers free-floating metal packings, metal rod packing rings, metal scraper rings, metallic packings. The Garlock Packing Co.

315 Piston Packing—Sixteen-pp Bulletin 5903 presents engineering data on Darcova Pumcups for packing pistons of air cylinders, hyddraulic cylinders and reciprocating pumps. Included are operating diagrams and a list of typical installations, as well as helpful data on Pumcup compositions. Darling Valve & Mfg. Co.

316 Mechanical Packings—Featured in 24-pp Catalog 56 are several recent packing developments including the multi-purpose Bel-Vee V-Ring packings, the long wearing crisscross braid packing series, twisted foil packings for oil and distillate temperatures to 1000 F, and an Inconel-wire reinforced plastic packing for valves handling superheated steam at temperatures up to 800 C. Packings for every industrial application are covered. The Belmont Packing & Rubber Co.

317 Self-Lubricating Packings—Featured in this 30-pp Bulletin PC-103 is detailed information on company's line of packings with internal lubrication. Application chart, table of physical properties, and ordering instructions. Greene, Tweed & Co.

HEATERS, HEATING

318 Unit Heaters—Performance and application information on company's line of unit heaters for steam and hot water heating systems is presented in 16-pp Catalog 159. Steam and hot water performance data tables are included, as well as dimensional data, mounting suggestions, points on selecting and locating unit heaters. Modine Mfg. Co.

319 Direct Fired Heaters—Complete description and specifications on unit heaters, duct furnaces and heavy duty heaters are presented in 12-pp Bulletin A1-1.2b. Cutaway views and construction features are included. Reznor Mfg. Co.

320 Thermo-Panel Coil—Technical Data Bulletin 355 is a 48-pp guide to company's panel coil for heating and cooling applications. Features of materials and design are illustrated and described, and detailed specification and dimension tables, heat transfer coefficient charts, capacity tables included. Dean Thermo-Panel Coil Div., Dean Products, Inc.

MECHANICAL POWER TRANSMISSION

321 Fluid Drive—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are also covered in detail. Industrial Div., American-Standard.

322 On Drive Selections—Steps in selecting a heavy duty V-belt drive are outlined in 16-pp Bulletin DH-301. Service factor table, design horsepower table, minimum installation allowance table and complete selection tables are included. The Gates Rubber Co.

323 Helical Gear Reducers—Information on a complete line of helical gear speed reducers is contained in 20-pp Book 2751. Provides selection data on 20 reducer sizes in double, triple and quadruple reductions, and contains tables of load classes and service factors, horsepower and torque ratings, dimensions, overhung load for high and low speed shafts, and mounting data. Link-Belt Co.

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324 Worm Gear Sets—Basic data needed for accurate selection of worm gear sets is provided in 24-pp Catalog 3800. Illustrated with explanatory drawings, it contains basic information on worm gearing as well as selection tips, design data, calculation of bearing loads. De Laval Steam Turbine Co.

325 Power Transmission Products—Catalog 759 contains 104-pp of engineering data, specifications and prices on roller chain, sprockets, couplings and conveyor chain. Data includes material on selection of roller chain drives, speed ratios for sprocket combinations, chain length tables, illustrations of various standard attachments, and technical specifications. Diamond Chain Co., Inc.

326 Grommet V-Belts—Advantages of company's grommet V-belts are illustrated and described in this 8-pp bulletin. Belt features are fully described, and a section on how to figure a V-belt drive is included. Goodall Rubber Co.

327 Anti-Friction Bearings—Catalog 424-B entitled "The broadest line in the anti-friction field," is an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

328 Filled Teflon Bearings—Technical Bulletin CP-558 describes filled Teflon bearings designed for use as radial bearings on vertical pumps. Characteristics of filled Teflon bearing materials are discussed. Chemical & Power Products, Inc.

329 Bushings and Hubs—Eight-pp Bulletin A-628G contains detailed information on bushings and hubs designed to simplify mounting wheels on shafts. Dimensional data and diagrams are included, along with price lists. Dodge Mfg. Corp.

LUBRICANTS, LUBRICATION

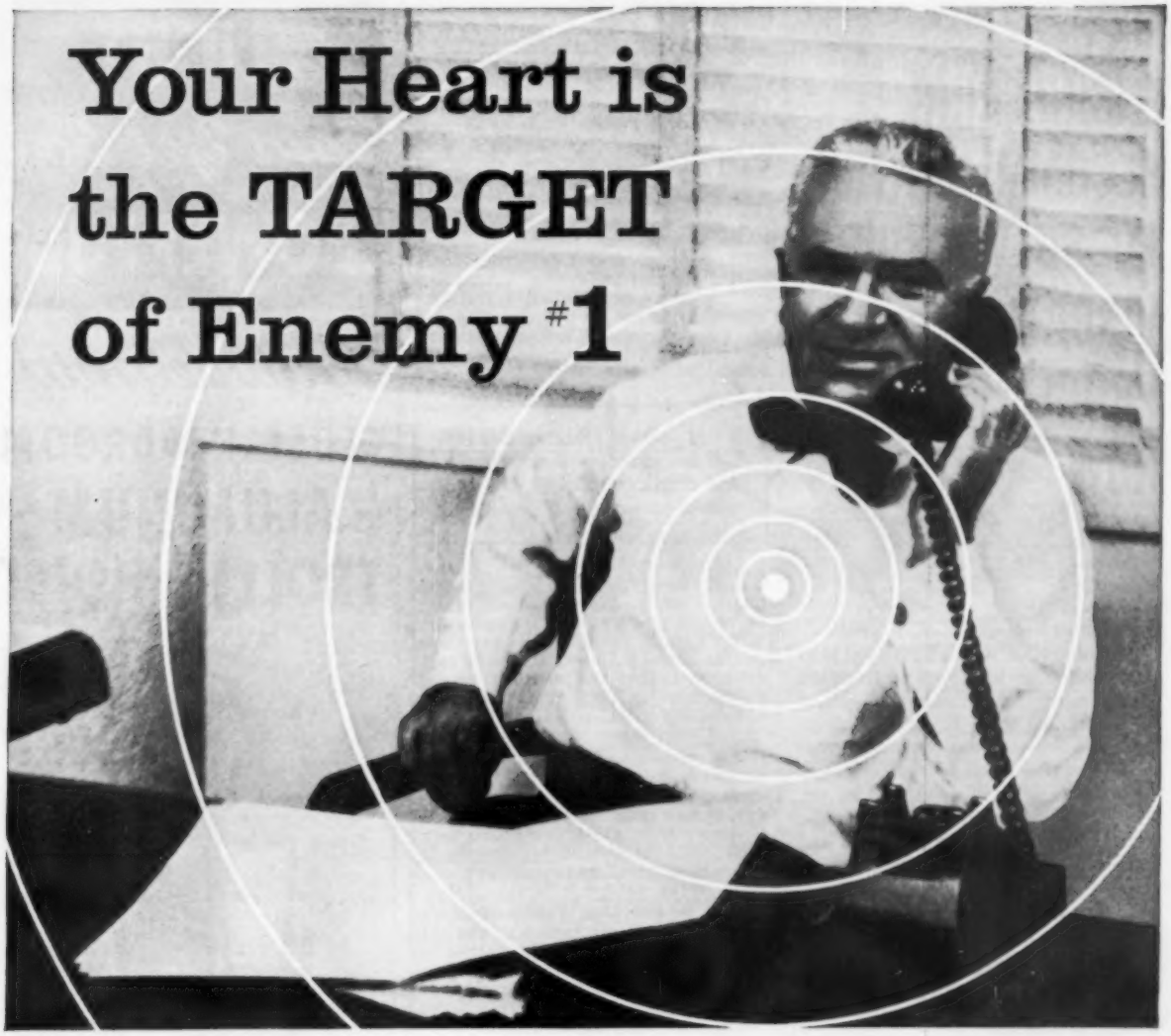
330 Organized Lubrication—Benefits of organized lubrication—major cost control factor are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority in an organized lubrication system discussed. Method of determining savings and setting up records to measure results covered. Texaco, Inc.

331 Lubricant Data—Characteristics, advantages of company's line of specialized fluid and grease type lubricants are described in 32-pp Data Book 59-1. Includes sections on control of friction, use of grease type lubricants, proper applications, and recommendations for various operating conditions. Lubriplate Div., Fiske Brothers Refining Co.

332 Product Guide—This handy little booklet gives information on manufacturer's line of industrial products—general lubricants, greases, diesel lubricating oils, metalworking oils, hydraulic oils, heat-transfer oils, waxes, petro-chemicals, spray oils, solvents, others. Sun Oil Co.

VALVES, TRAPS, PIPING AND FITTINGS

333 Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS.



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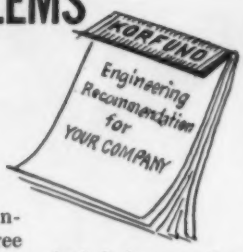

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(Begins on page 242)

Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive attack of chemicals and atmospheres are detailed. Jenkins Bros.

334 Industrial Valves—Bulletin 507X illustrates and describes company's line of industrial valves for control of air, gas, liquids and solids. Features photos and descriptive detail on a variety of valves, including butterfly valves, water valves, slide valves. W. S. Rockwell Co.

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335 Check Valves—Detailed information on a line of silent check valves designed to combat surge and water hammer problems is presented in this 20-pp bulletin. Photos of typical installations are included, as well as engineering data and flow charts. Combination Pump Valve Co.

336 Valve Guide—Circular 555 contains 24-pp of detailed information for selecting valves, boiler mountings, and lubricating devices. Completely indexed, it contains technical data tables and application information. The Lunkenheimer Co.

337 Bronze Gate Valves—Featured in this Product Bulletin 198 are bronze unit bonnet gate valves for 125-150 WSP. Dimensional data are included, as well as sectional view of valves showing component features. The Wm. Powell Co.

338 Nuclear Valves—Described in this Product Bulletin N2-12-585M are valves designed for critical applications in the nuclear industry. Covers valves for a wide variety of radioactive and non-radioactive services, including reactor coolant and moderator systems, fuel processing, waste disposal systems. Nuclear Div., Alloy Steel Products Co.

339 Magnetic, Motorized Valves—Within its 24 pages Catalog V-58 illustrates and lists specifications of magnetic and motorized valves for use with air, water, gas, steam, oil and refrigerants. Also included are solenoid coil rating tables. Another feature consists of two flow charts—one for liquid, the other for compressible fluids. The Mercoid Corp.

340 Steam Trap—Bulletin 257 describes features and operation of a steam trap which uses the kinetic energy of steam to close the valve. Operation details are illustrated and capacities tabulated. Sarco Co., Inc.

341 Steam Trap Primer—Fundamental facts about drainage and

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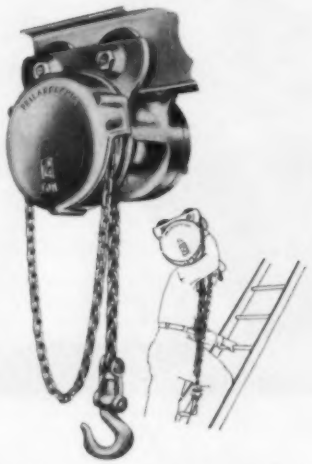

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steam trap operation are presented in this 16-pp steam trap primer. Operating principles of steam traps are fully detailed, and data on steam trap maintenance and application included, as well as question-and-answer section covering common steam trap problems. Barnes & Jones Inc.

342 On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. in steel and semi-steel, and in helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation, testing, repairs. Armstrong Machine Works.

343 Valved Couplings—Features and applications of company's valved couplings designed for instant shut-off are detailed in Bulletin H-1686. Covers couplings for high pressure, vacuum and very low pressure, for impact air lines and for hard to handle fluids. Snap-tite.

344 Fluid Line Coupling—Catalog 100 contains data sheets describing company's line of quick-connective fluid-line couplings for pneumatic, hydraulic, oxygen, acetylene, steam, various gases and liquids service. Photos and dimensional diagrams are included. The Hansen Mfg. Co.

345 Sewer Structures—Structural and material advantages of corrugated sewer pipe are detailed in 44-pp Manual CMS-7458. Discusses structural durability of corrugated metal sewers, material durability, selection of structures, factors influencing capacity, joints and fittings, linings for failing sewers, installation and design data. Armco Drainage & Metal Products, Inc.

346 Glass Pipe and Fittings—Corrosion-resistant qualities of this Pyrex brand glass pipe and fittings which make it suitable for use under corrosive conditions are described in 44-pp Bulletin PE-3. Operating temperatures, physical characteristics, installation procedures are covered and specifications and dimensional drawings given. Corning Glass Works.

347 Process Piping—Chemical-resistant plastic pipe, fittings and valves are featured in 16-pp Bulletin CE-80. Advantages are detailed, and installation procedures outlined. Technical data tables are also included. American Hard Rubber Co.

348 Reinforced Plastic Pipe—Detailed information on characteristics and applications of reinforced plastic pipe is presented in the 16-pp Bondstrand Bulletin. Temperature and pressure curves are included, along with dimensional data and diagrams. Amercoat Corp.

349 Quick-Seal Couplings—Illustrated 20-pp Bulletin Q.S.R. 58 describes Quick-Seal couplings for hydraulic and pneumatic applications. Discusses three types of couplings—straight-through, single check-valve, and double check-valve. Cross-section drawings point out major features of

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8	What It Costs to Modernize Small Industrial Power Plants—24-page reprint of series of articles by H. D. Fisher from 1957 issues, giving six case studies of plants from 25,000 to 50,000 lb of steam per hour capacity.	1.00
9	Cherry-Hill—16-page reprint of article describing what construction preplanning is necessary. Article discusses use of consultants, methods of bidding, basic concepts, selling the project to management.	0.50
10	A Power Plant Primer—32-page reprint of article by A. W. Kramer explaining the fundamental principles of the steam-electric power plant and of each unit of principal equipment, showing how they all operate.	1.00
11	Pumps—4-page reprint of article "Pumps—and Why They Have Troubles." Some of the points covered in article: sagging foundation, distortion of base plate, proper packing and its importance	0.10
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DATA FILE

(Begins on page 242)

component, and complete details for each type given. Selection chart included. Titeflex, Inc.

350 Flexible Metal Hose—Featured in 8-pp Catalog 188 is a line of flexible metal hose, as well as rubber and synthetic hose, expansion joints and compensators. Detailed specifications and dimensional data are included. Flexonics Corp.

INSULATION

351 Insulation Coating—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's No-Drip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster, or composition surfaces. Lists applications. Mortell Co.

352 Insulation Specifications—This set of six specifications covers applications of Foamglas insulation for industrial equipment and piping. Each booklet contains tables of suggested thickness of insulation to be applied, drawings of installation procedure, supports, and recommended finishes. Booklets are devoted to low-, medium-, high-, and dual-temperature equipment and piping, to underground piping, and spheres. Pittsburgh Corning Corp.

353 Duct Insulation—Thermal and acoustical duct insulation made of long textile-type glass fiber is illustrated and described in this 8-pp Bulletin ULD-859. Includes detailed application specifications, data on characteristics of the duct liners, thermal efficiencies, sound absorption coefficients and other data. Gustin-Bacon Mfg. Co.

354 Fiber Glass Insulation—Applications and advantages of fiber glass as insulation are illustrated and described in this Product Bulletin F-100. Typical applications are shown and a table of dimensional data included. Pittsburgh Plate Glass Co.

ELECTRICAL

355 Drip-Proof Motors—Bulletin 857 contains 12-pp of detailed information on company's line of open drip proof and totally enclosed fan cooled motors. Construction features are described and tables of engineering data and specifications included. Brook Motor Corp.

356 Unit Substations—Tranfo-Units—packaged, compact unit substations—are described in 16-pp Bulletin 5604-1A. Provides basic design, application and specification information of value in selecting integrated combinations of equipment. Consisting of transformer with primary and secondary switchgear, these units permit voltage stepdowns at

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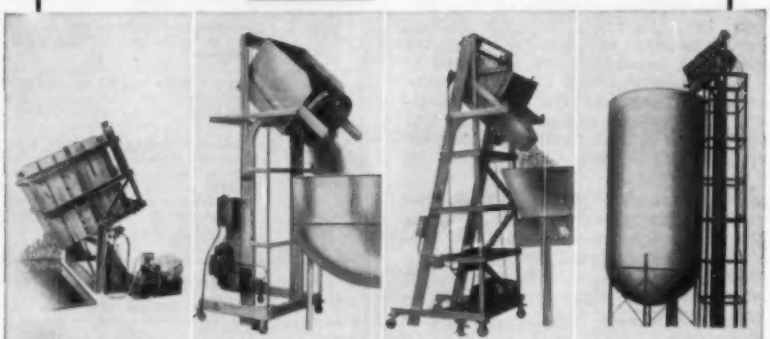

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Dumps up to 4 feet. Load capacity, 6000 pounds.

JUNIOR DUMPER
Dumps up to 8 feet. Load capacity, 700 pounds.

SENIOR DUMPER
Dumps up to 20 feet. Load capacity, 4000 pounds.

VERTICAL DUMPER
Dumps to any practical height. Load capacity, 4000 pounds.

Yes, no matter what size, shape or type container you use to receive, store or process free-flowing material — or whether it's a special in-plant container — ESSEX can supply the necessary dumper.

ESSEX dumpers are flexible in design so they can be modified to suit **your** job conditions. For the safe, reliable, economical way to lift and dump material in any container, call upon ESSEX for the answer.

SEND FOR NEW 8 PAGE INFORMATIVE CATALOG NO. 59

ESSEX CONVEYORS, INC.
Dept. PE, 101 Golden Street, Newark 3, N. J.

For more facts circle 658 on Reply Card

the load area. Ratings, dimensions, weights and outline drawings of 16 types of Tranfo-Units, specifications provided. I-T-E Circuit Breaker Co.

357 **Single-Phase Motors**—Bulletin 470-B describes integral horsepower single-phase motors, ratings from ¾ to 20 hp, in open protected, totally enclosed fan-cooled and explosion proof. Bulletin outlines company's "weatherizing" treatment which makes motors suitable for use in damp, dirty or corrosive atmospheres. Tabulated ratings, dimensions, weights included. Motor Div., Robbins & Myers, Inc.

358 **Molded Case Breakers**—Features and advantages of company's molded case circuit breakers are illustrated and described in 28-pp Bulletin GEA-6754. A cutaway view tells the inside story of circuit breaker design, and complete selection data, including section on determining ampere rating, is furnished. General Electric Co.

359 **Switch Wiring Diagrams**—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters are used. Allen-Bradley Co.

360 **Enclosed Switches**—Catalog 83, 22-pp, Catalog 84, 16-pp, and Catalog 101, 24-pp, describe enclosed switches for industrial uses. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

361 **Protective Equipment Guide**—Form SPD is a 24-pp handbook on selection of protective devices for electric circuits, motors, appliances and apparatus, and is based on 1959 National Electrical Code. Besides providing suggestions on how to select right kind of protections, booklet provides wiring diagrams, motor tables. Bussmann Mfg. Co.

On pages 237-238 are two postage-free Reader Service Cards provided for your convenience in ordering these catalogs. You may also use the cards to order any literature mentioned in ads.

362 **Electrical Equipment**—Condensed Catalog No. 9 contains 48-pp of desriptive data on company's line of electrical products, including conduit bodies, conduit fittings, connectors, ground fittings and EMT fittings. Dimensional data and features are shown. Gedney Electric Co.

363 **Distribution Equipment**—Detailed information on company's line of electrical distribution equipment is presented in 82-pp '60 Marketeer,

Life in these excited states...

CORROSION CONTROL LABORATORY

"This, gentlemen, is all that is left of Plant 'B' "

Survival... first rule for plastic pipe

Passive resistance... that's plastic's survival technique under the onslought of corrosive chemicals. Ace plastic pipe, for instance: inert, impervious, age-less... while metals and lesser materials dissolve and crumble. Best for the money anywhere... backed by 108 years' experience.

All-purpose rigid PVC. Sched. 40, 80 & 120, ½ to 4". Threaded or socket-weld fittings. Valves ½ to 2". NSF-approved. *Bul. CE-56.*

Improved design... now 12 gpm. All wetted parts acid-resistant, wear-resistant Ace hard rubber. Finest available. *Bul. CE-55.*

Flexible poly pipe, ideal for water lines, drains, underground pipe or conduit. Sizes ½ to 2", long coils, NSF-approved for drinking water. *Bul. CE-57.*

World's best chemical valves... at moderate prices. All-plastic, rubber-lined, or all-hard-rubber. ⅛" pet cocks to 24" gate valves.

ACE processing equipment of rubber and plastics

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DIVISION OF AMERACE CORPORATION
Ace Road • Butler, New Jersey

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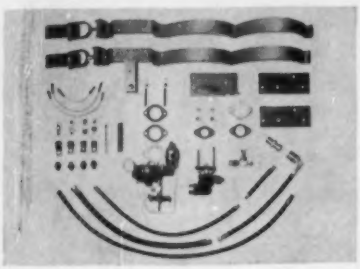
BEAM LP-Gas CONVERSION SYSTEMS



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and all others

Whatever the make and model, whatever the brand and size of engine — BEAM'S ready-to-install systems have everything you need to convert your fork lifts and tow trucks to clean-burning, inexpensive LP-Gas.

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Please send me complete details for Beam conversion of _____ (equipment).

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DATA FILE

(Begins on page 242)

Catalog M-160. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. Tables of essential data. BullDog Electric Products Co., Div. I-T-E Circuit Breaker Co.

364 Portable Electrical Cable—Detailed information on portable electrical cable for a variety of industrial applications is presented in this condensed catalog. Basic construction covered. Western Insulated Wire Co.

365 Rubber Power Cable—This 32-pp catalog contains detailed information on design features, insulations, and performance highlights of butyl rubber power cable. Includes data on available constructions, ampacity and installation data. Anaconda Wire & Cable Co.

366 Instrumentation Cables—Featured in 8-pp Bulletin RCD-400 is a line of instrumentation cables for telemetering, data recording, circuit control testing, and electronic computers. Cable design and selection of insulating and jacketing materials is covered, and specifications included. Rome Cable Corp.

367 Trolley Busway System—Three bulletins offer help on electrical installations involving cranes and hoists, assembly and production lines, test lines and other moving electrical equipment. Bulletin 60, 40-pp, covers 60 amp systems; Bulletin 70, 32-pp, covers 225-500 amp systems; Bulletin 75, 44-pp, covers 100 amp systems. Each includes special section on installation planning and procedure, mounting. Feedrail Corp.

368 Inverted-Y Electrification—Advantages of aluminum inverted-Y electrification for traveling cranes, ore bridges and other similar moving units requiring heavy amperages are detailed in 8-pp Electrification Booklet 1. Design and construction details on construction bars, splices, insulators, take-up springs, anchors, channel spacers, enclosures, and current collectors are illustrated. The Cleveland Crane & Engineering Co.

369 Control Batteries—Twelve pp Bulletin CP-539 describes batteries for control, switchgear and auxiliary power. Construction details are illustrated and described, and specifications are given as well as discharge characteristics curves. C & D Batteries, Inc.

370 Battery Technology—Bulletin GB-1896 is a 36-pp handbook of technical instructions and engineering data on the care of motive power storage batteries. Covers all phases of lead acid battery theory, operation and maintenance. Captioned line drawings are included, as well as basic information on specific gravity changes, charging and discharging cycles, plate composition. Gould-National Batteries, Inc.

371 Testing Instruments—Bulletin 19-59, 16-pp, features company's electrical testing instruments, including ohmmeters, ground testers, dielectric test sets, motor, rotation tester, cable fault locating equipment, transformer turn ratio test sets, corona test equipment, frequency meters, tachometers, other. Includes photos and descriptions of each type, including chief features. James G. Biddle Co.

372 Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

373 Wiring Devices—Catalog 60, about 80-pp, presents ordering data on wiring devices including a wide range of switches, convenience outlets, lampholders, fluorescent devices, cord connectors, adapters, wall plates, accessories etc. Fully illustrated with photos, catalog provides condensed information on features, dimensions, applications. Pass & Seymour, Inc.

374 Fuse Data—Illustrated and described in this Product Booklet 3 is company's line of fuses for a variety of applications. Covers dual-element cartridge fuses, renewable fuses and renewal links, one-time cartridge

'PHONE COMPANY PROTECTS DELICATE APPARATUS FROM ENGINE VIBRATION

Problem: To shield delicate switching apparatus of General Telephone Co. of Los Angeles from the dangerous vibration of this 300-hp Fairbanks-Morse Diesel-Electric Generator.

Solution: Unique Resilient Mounting by Korfund System engineers. It protects sensitive electronic elements and personnel from vibration, eliminates need for costly foundation.

To get answers to all vibration, shock and noise problems, write for our interesting Booklet 63. To obtain an answer to your *specific* problem, send for a complete Engineering Recommendation free. Just fill in and mail today the coupon on page 246.

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48-23M 32ND PL., LONG ISLAND CITY 1, N. Y.
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Most Complete Line Ever!

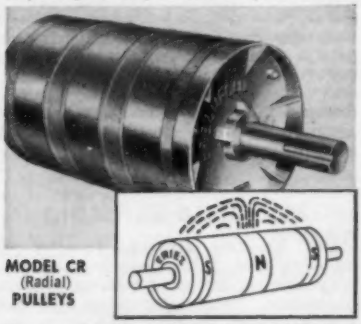
ERIEZ

permanent non-electric Erium-powered*

MAGNETIC PULLEYS

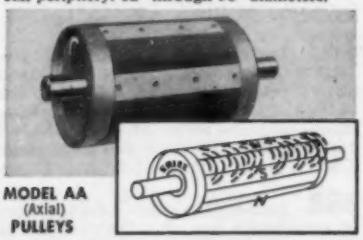
Now in 2 "duty-rated" designs—to give you the finest automatic separation for your exact application—fine iron or tramp iron removal.

NEW, EXPANDED LINE! New design, new magnetic efficiency permit increased operating range and effectiveness with 2 different magnetic actions. Peak protection for all operations—from rugged crusher protection through delicate product purification operations.



MODEL CR (Radial) PULLEYS

For removing large pieces of tramp iron from heavy depths of flow. Provides a strong, deep magnetic field of equal intensity around the full periphery. 12" through 36" diameters.



MODEL AA (Axial) PULLEYS

Excellent for fine iron separation, as well as small and medium pieces of tramp iron, in average material flows! Strong magnetic field of equal force extends across the full width of the pulley. 8", 12", 15", & 18" diameters.

Prevent product contamination, machinery damage, fires, explosions, downtime. 2 designs, 4 magnetic strengths, 8 diameters, 14 belt widths. No operating or maintenance costs. For all materials, wet or dry, on belts of non magnetic material. Fast, simple installation.

*Erium —an exclusive, high quality permanent magnetic power source specifically designed and energized by Eriez.

New fact-filled 6-page bulletin has installation photos, selector guide, etc. Write today! Eriez Mfg. Co., 71-BB Magnet Drive, Erie, Pa.

ERIEZ

For more facts circle 662 on Reply Card

fuses, indicating one-time cartridge fuses, plug fuses and others. Economy Fuse & Mfg. Co., Div. Federal Pacific Electric Co.

375 Electrical Enclosures—This catalog describes a line of dust and oil-tight electrical enclosures made of sheet steel, including wiring boxes, control panel enclosures, control consoles, pushbutton enclosures, wireway, and wiring troughs. Features and applications are detailed and specifications and dimensional diagrams are among data included. Hoffman Engineering Corp.

376 Cable Troughs—This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers and many special devices. The Globe Co.

377 Surface Metal Raceways—Eight-pp Form 607 describes features and advantages of company's surface metal raceways and multi-outlet systems. A variety of typical applications are illustrated, and capacity data and specifications given. The Wiremold Co.

378 For Rewound Motors—Eight-pp Booklet B-7622 describes a solventless epoxy encapsulation-type insulation for rewound motors. Outlines physical and chemical properties and describes typical applications. Westinghouse Electric Corp.

379 Electrical Insulating Varnish—This 36-pp catalog covers selection and application of electrical insulating varnishes with complete details on all electrical and mechanical properties as well as operating temperature limitations. Includes charts, graphs and illustrations on temperature conversion, solvents, specific gravity, viscosity, also specifications. Minnesota Mining and Mfg. Co.

LIGHTING

380 Lighting Fixtures—This 12-pp condensed catalog gives a compact presentation of company's fluorescent and Brascolite incandescent luminaries. Data on surface and pendant mounted units, recessed luminaries, and Gratelite electric ceilings provided. Edwin F. Guth Co.

381 Incandescent Lighting—The 24-pp "Incandescent Lighting Guide Book" features sections on the general advantages of incandescent lighting, the history of incandescent lamp developments, and includes chapter on basic types, bulb shapes, sizes, glass types and finishes, and bases. Sylvania Electric Products Inc.

382 Emergency Lighting—Twenty-pp Publication 243A features emergency lighting systems for commercial, industrial and other types of buildings. In addition to describing the systems, catalog contains complete information and specifications on all components. The Standard Electric Time Co.

WRITE TODAY FOR DATA ON NEW

ERIEZ

HI-VI

electro-permanent magnetic

BIG CAPACITY VIBRATORY FEEDERS

(Pat.)

Greatly increased capacity—up to 50 tons per hour • Enclosed drive element is furnished as *standard* • New A.C. electro-permanent magnetic drive • No rectifier needed—operates directly off an A.C. line • Laminated fiberglass leaf springs resist breakage • Suspended or floor-mounted models • Low power consumption; low operating and maintenance costs • Automatic, accurate, variable rate of feed for all bulk materials (fine powders to large, lumpy materials) spreading, aerating, cooling, proportioning, etc.

Special units available for hazardous, dusty locations—fully accepted by Mill Mutual. Other models available, with feeding capacities ranging from tons to ounces per hour.

Eriez Mfg. Co.
71-BA Magnet Drive, Erie, Pa.

Please mail literature on big capacity feeders to:

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ERIEZ

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Your ideal source for custom-designed cranes—CONCO

This unique installation combines a 2-ton, 38'5" span circular crane and a 20-ton, 24'2" span annular crane, each with a 130' lift. One engineering problem solved: On the annular crane the outside wheels must travel at 195 FPM; the inside wheels at 125 FPM. Conco builds cranes for virtually every class of service, including specialized spark and explosion-proof cranes, two-hook cranes, and cranes employing closed-circuit TV remote control operation. A complete design service, including sample specifications, is available. Write us for bulletin 500B covering the Conco line of cranes, hoists and trolleys.

CRANES HOISTS CONCO

Material Handling Division
CONCO ENGINEERING WORKS, INC., Mendota, Ill.
AFFILIATES: Sparton Tool Division—Powered Sewer Cleaning Equipment
Field Control Division—Barometric Draft Controls
Conco Building Products, Inc.—Brick, Tile, Stone
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What BRONCO PATENTED* branding means to you!

You know your electrical cords and cables are the toughest you can get when you find this name molded* indelibly into the outer 67.32% Neoprene jacket.

YOU KNOW YOU ARE GETTING WHAT YOU ORDERED

67.32% NEOPRENE · TYPE W 3 COND #8

HIGHEST NEOPRENE CONTENT IN THE INDUSTRY to give your cable maximum protection from oil, heat, acid, abrasion, etc.

TYPE AND SIZE are molded* into the jacket as well as rated voltage & "P1168M," Bureaus of Mines official approval number.

SELF-MEASURING—Branding* is repeated every two feet exactly. Want 20 feet? Count 10 Broncos and cut.

*U.S. PATENT #2867001

Write for free sample!

WESTERN INSULATED WIRE CO., LOS ANGELES 58, CALIF.
For more facts circle 665 on Reply Card

DATA FILE

(Begins on page 242)

383 For Hazardous Locations—Explosion-proof and dust-ignition-proof mercury vapor lighting fixtures are described in Bulletin 2705. Lists explosion-proof fixtures with five styles of reflectors, all available with or without guard, two styles of dust-ignition-proof units. Crouse-Hinds Co.

384 Lighting Maintenance Tips—Principles and advantages of good lighting practice are presented in this 48-pp lighting maintenance manual. Much useful information has been added to this revised edition, including a guide to trouble shooting fluorescent installations, a section on planning group replacement of lamps, cleaning. Champion Lamp Works.

385 Group Relamping Plan—Eight-pp Booklet A-6832 describes a group relamping plan designed to reduce costs, provide better lighting, and cause fewer work interruptions. Sample calculations provide data for setting up a relamping schedule. Westinghouse Electric Corp.

MATERIALS HANDLING

386 Electric Hoists—Twelve-pp Bulletin DH 133D describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

387 Improved Hoist—Complete information on five models of a new sealed ratchet lever hoist is provided in Bulletin ADH-78. Lists specifications and features of these hoists ranging from ¾- to 6-ton capacities. Coffing Hoist Div., Duff-Norton Co.

388 Industrial Cranes—Advantages of company's line of industrial cranes for a variety of applications are detailed in this illustrated bulletin GL-657. Along with illustrations of the cranes in action, it includes data on capacities, etc. Industrial Crane & Hoist, Ingersoll Products Div., Borg-Warner Corp.

389 Custom Cranes—Twelve-pp Bulletin 5000-B describes and illustrates electric and hand operated overhead traveling cranes, jib cranes, hand hoists, I-beam trolleys, and special crane-type equipment. Covers in particular detail custom-engineered overhead electric traveling crane bridges and electric trolley hoists, available in a wide range of capacities, speeds and spans. Conco Engineering Works.

390 On Spiral Conveyors—Described in 60-pp Catalog 951 are spiral conveyors and fittings for meeting practically any requirment and operating conditions. Four principal types—helicoid, sectional flight, ribbon flight, and cast iron—are listed along with special types. Selection

ADAMS FACT FILE #3

INSTRUMENT AIR

Clean Dry Air Supply Will Reduce Production Down-Time . . . Instrument Maintenance . . .

Wet, dirty compressed air has no place in the process industries. In instrument air supply lines it can cause havoc. Whether it be motor air in a control circuit or supply air to the control panel, absolutely clean dry air is vital. Moisture elimination is the major consideration in providing suitable air for instrument and control systems.

Since most plant compressors in use today are oil lubricated, a finite amount of oil is present with the water vapor in the discharge. This carry-over condenses as an oil-water emulsion which often causes serious fouling of instrument components. To eliminate this oil-moisture condensate in the air lines, it is necessary to remove it before it reaches the distribution system. This is done by cooling the air before the receiver. It is advisable to cool well below the ambient conditions to provide the lowest possible humidity at the instrument panel or control units.

Two Stage System Design for Economy

The ideal method to achieve high quality air is a two-step operation.

1—An Adams Aftercooler . . . providing 2° F. cooling . . . and Cyclone Separator installed between the compressor and receiver to remove the bulk of moisture carry-over.

2 — A chemical dryer installed down stream to provide the polishing action necessary for the desired minimum humidity.

Thus, the bulk of water . . . 90% . . . is removed by the Aftercooler-Separator using plant water for cooling. A minimum moisture load is then left to be removed by more expensive methods. Under normal circumstances, all of the oil present in the compressor discharge will be removed in the Aftercooler-Separator. Fouling of the chemical unit is then virtually eliminated.

Poro-Stone Air Filter at Panel Provides Dirt-Free Control Air . . .

In spite of the efficiency of the Adams Aftercooler and Separator, there still will be some dust and dirt present in the instrument air system. That's why it is advisable to install an Adams Poro-Stone Air Filter in the line just before the control panel.

Separation by the Adams unit is in two stages — centrifugal and diffusion. Centrifugal force throws the foreign matter to the walls of the filter body where it is trapped in slots and drained. Remaining particulate matter is removed as the air passes through the pores of the Poro-Stone element.

This final protection for your instruments will minimize control system failures and process down-time. Instrument maintenance will be sharply reduced.

Literature Will Help Air System Design

For further information on how the complete line of Adams air equipment can help you provide a foolproof instrument air supply, write today for your copy of Bulletin No. 712 on Aftercoolers and Separators and Bulletin No. 117 on Poro-Stone Air Filters to the R. P. Adams Company, Inc., 254 East Park Drive, Buffalo 17, New York.

For more facts circle 666 on Reply Card

tables list materials which can be effectively handled in a spiral conveyor, giving weights, loading classifications, characteristics and horsepower factors. Data on spiral feeders is provided. Also listed are unit drives, along with tables for drive selection. The Jeffrey Mfg. Co.

391 Vibrating Conveyors—Advantages and features of vibrating conveyors are detailed in 16-pp Catalog 66. Layouts and flow charts showing how conveyors can be designed to perform a wide variety of processing operations at the same time the material is being conveyed are included. Ajax Flexible Coupling Co., Inc.

392 Pneumatic Conveyors—Twelve-pp Bulletin M-588 describes a line of air conveying equipment and systems from low density-low pressure type to the highest density-high pressure type. Includes dimensional and capacity data, drawings of common arrangements. The Day Co.

393 Overhead Conveyor—This 12-pp catalog contains latest information about company's overhead conveyor systems designed to meet a variety of industrial needs. Describes typical installations and includes layouts, together with complete engineering specifications. Chainveyor Corp.

394 Conveyors, Systems—Unibilt conveyors, featuring standardized unit design, are discussed as to economy, ease of erection and alteration, other benefits, in 6-pp Bulletin CL858. Illustrations show available types of horizontal belt conveyors, inclined belt conveyors and live roll and gravity conveyors. Conveyor Specialty Co., Inc.

395 For Materials Handling—Specifications and illustrations on two-wheel trucks dollies, wagon trucks, platform and shelf trucks, and many styles of casters, jacks and semi-live skids are given in 12-pp Bulletin 59G. Also included are specifications on demountable rubber tired, plastic, and pneumatic wheels. Nutting Truck and Caster Co.

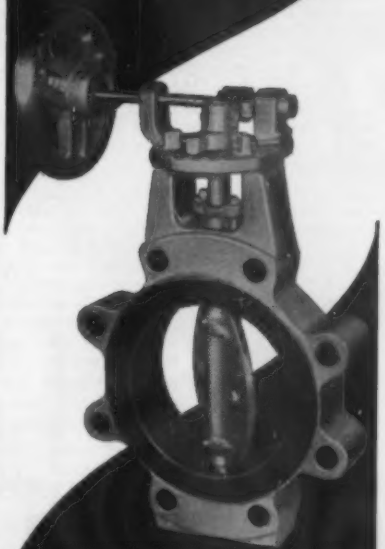
396 Automatic Bulk Handling—Bulletin 531, 12-pp, on new techniques for automatic bulk, handling describes pneumatic conveying methods in integrated manufacture. Describes two polyethylene handling installations to show how a system approach to air conveying solves complex handling problems. Dracco Div., Fuller Co.

397 Multi-Purpose Dumper—Described in this 8-pp catalog are vertical, senior, junior and hydro dumpers. Pictures show applications of dumpers in various industries, and illustrate how the equipment can be adapted to handle bags, boxes, bulk and drums. Specifications and dimensional drawings are included. Essex Conveyors, Inc.

398 Self-Dumping Hopper—Described in Bulletin 260 is a self-dumping hopper for low-cost handling of wet or dry, hot or cold, bulk materials. A variety of standard

INSTALLATION
- COSTS LESS
- EASIER • SIMPLER
- SPACE SAVING

CLOSURE
- POSITIVE
- DROP-TIGHT
- FASTER



ROCKWELL
Resilient-Seated
BUTTERFLY VALVES

ENGINEERING FACTS

For control of air, gases or process fluids Rockwell Wafer Butterfly Valves give you these installation, service and maintenance advantages not found in other types:

1—Narrower body, less length and simpler construction—make valve lighter, easier to install in less space at lower overall cost.

2—Equalized pressure on valve disc makes opening and closing simple. Minimum pressure drop.

3—Rubber, Neoprene, Hycar, Viton or other resilient synthetic seat forms positive drop-tight seal on shut off and a tight gasket seal between valve and pipe flanges. The "Keelok" seat is easily removable.

4—No fouling—no clogging—valve is self-cleaning.

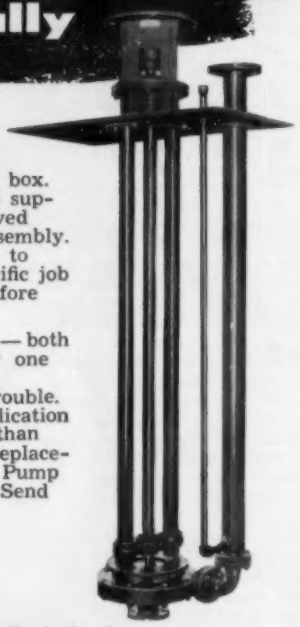
5—Valve may be operated manually or by automatic remote control. Sizes—from 2" to 48".

Write for Bulletin 583.

W. S. ROCKWELL COMPANY
2920 Eliot St. • Fairfield, Conn.

For more facts circle 667 on Reply Card

NAGLE PUMP handles molten sulfur efficiently and economically



This Nagle 1½" type YWS-CS centrifugal pump, one of several built for DuPont, handles molten unfiltered sulfur. Discharge line is steam jacketed. There is no stuffing box. Bearing in contact with the hot material is supported in a split yoke which can be removed and replaced without major shop disassembly. Impeller and casing are of special alloy to resist heat, and abrasion. Built to do a specific job for a long period of time. Pump is shown before installation of motor.

There are many types of Nagle Pumps — both horizontal and vertical shaft units — every one designed and constructed for use where ordinary pumps give trouble. If yours is a tough application you're doubtless more than paying (in service and replacement parts) for a Nagle Pump — so why not have it? Send for literature.

Nagle Pumps, Inc.,
1267 Center Ave.,
Chicago Heights, Ill.

Tough jobs call for

Nagle PUMPS

FOR ABUSIVE APPLICATIONS EXCLUSIVELY

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Paul Cheremisinoff, Vice Pres. of American Polyglas Corp., and Peter Durkin, General Sales Mgr., proudly examine newly perfected products.

Development of New Low Cost Plastic for Roofing • Siding • Glazing

American Polyglas Corp., leaders in plastic fiberglass technology, announce that their products, developed to exceed U.S. Gov't Standards, are now available at the lowest cost in the industry. Polyglas Reinforced Panels are made to nest with all standard metal corrugations. Polyglaze Panes are cut to commercial sash sizes. Light, durable and shatterproof, both provide better light transmission and appearance . . . insulate against heat and cold. . . eliminate maintenance.

For additional information, write to:

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Carlstadt, New Jersey

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PUNCH PRESS SHOCK STOPPED

Problem: To cushion the dangerous shock of this 400-ton capacity Clearing Press at the RCA-Whirlpool-Seeger Plant in St. Paul, Minn.

Solution: Unique Resilient Mounting by Korfund System engineers. It protects the structure, nearby equipment, personnel and the press itself from any shock damage. Substantial savings of money were effected, too, since no special foundations or costly reinforcement were needed.

To get answers to all vibration, shock and noise problems, write for our interesting Booklet 62. To obtain an answer to your *specific* problem, send for a complete Engineering Recommendation free. Just fill in and mail today the coupon on page 246.

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48-23M 32ND PL., LONG ISLAND CITY 1, N. Y.
IN CANADA: 510 CANAL BANK, VILLE ST. PIERRE, MONTREAL 32, QUEBEC, CANADA

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DATA FILE

(Begins on page 242)

models are pictured and described in detail. Roura Iron Inc.

399 **Belt Fasteners**—Bulletin F-112D, 6-pp, describes company's belt fasteners and rip plates designed to join and repair conveyor and elevator belts in any width. Application procedure is illustrated, necessary tools described. Flexible Steel Lacing Co.

400 **Materials Handling Hose**—Presented in Bulletin S-5121 is a line of materials handling hose for industrial applications. These include use in sand blasting, for steel shot blasting, for industrial vacuum cleaners, and for blowing insulation into walls. The Goodyear Tire & Rubber Co.

STORAGE, SHOP EQUIPMENT

401 **Guide to Shelving**—To assist plant engineers in selecting proper shelving for all storage requirements. 64-pp Catalog 30 offers detailed suggestions for correct shelving and storing materials, loose and packed parts, record files. Shop equipment and storage cabinets are also described and instructions included for planning of stockrooms. Deluxe Metal Products Co. Royal Metal Mfg. Co.

402 **Steel Equipment**—Catalog 100 H contains 92-pp of detailed information on steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and specification, as well as installation photos. Lyon Metal Products, Inc.

403 **Storage Racks**—Bulletin R-400, 12-pp, illustrates and describes a wide variety of storage racks manufactured by the company. Application drawings, photos and diagrams are included. Chicago Tramrail Corp.

MAINTENANCE

404 **Basic-Roofing Information**—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses roofing practices. Johns-Manville.

405 **Handbook on Coatings**—This is a 32-pp treatise highlighting the stopping and preventing of rust on nearly all types of rustable metal. Book contains information and recommendations to enable determination of specific coating needed. Basic principle of Rust-Oleum's fish oil penetration into a metal is shown. Rust-Oleum Corp.

406 **Zinc Coating**—This bulletin describes a special zinc coating applied as a paint to provide galvanic protection to metals. A variety of applications are detailed. Subox, Inc.

407 **Industrial Floors**—Many types of industrial floors are studied and

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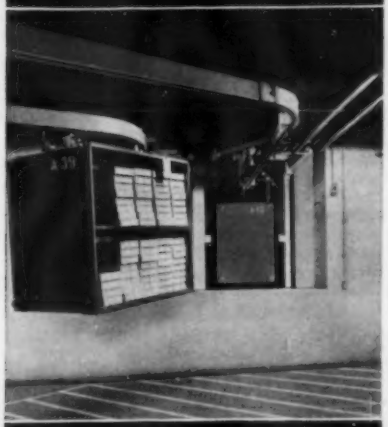

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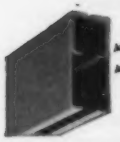

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their soil removal problem analyzed in this 8-pp booklet, complete with charts, list of cleaning compounds, and descriptions of cleaning methods. Methods of sanitizing, stripping wax and paint, and of absorbing liquids discussed. Oakite Products, Inc.

408 For Overhead Maintenance—Bulletin G205RR, 8-pp, tells how to control costs when maintenance goes above arm's reach—for painting and cleaning, electrical work, etc. Pictures a variety of scaffolding arrangements. Provides brief product information on steel and aluminum scaffolding, ladders. The Patent Scaffolding Co., Inc.

409 Industrial Vacuum Units—This bulletin describes heavy-duty vacuum units, both portable and stationary, designed to reclaim, process and convey many types of materials, as well as remove dirt, litter. Among applications covered are machine sump cleaning, removing press punchings, cleaning boilers, conveying plastic pellets. Details are given on range of standard and special models. Invincible Vacuum Cleaner Mfg. Co.

410 Industrial Vacuum Cleaning—Twelve-pp Bulletin 155 B describes both stationary vacuum cleaning equipment and portable industrial vacuum cleaners, the latter in both light and heavy-duty types. Recent improvements in collection and dumping methods are also covered. Spencer Turbine Co.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

411 Pipe Tools—Ordering and application information on Rigid pipe tools is provided in 16-pp illustrated Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

412 Portable Electric Tools—Form 10 features a complete line of portable electric tools including drills, screw-drivers, impact wrenches, magnetic drill presses, sanders, grinders, hammers, holesaws, and forged tools. The Black & Decker Mfg. Co.

413 Industrial Wrenches Hand Tools—Tools for production lines, maintenance work and product servicing are presented in 156-pp Industrial Catalog 58-I. Loaded with pictures and tool facts, book describes in detail the complete line of over 4,000 tools—including chests and rollcabs, wrenches and sockets of all types, screwdrivers, pliers, pullers, etc. Snap-on Tools Corp.

414 Air Tools—The growing use of air tools for a variety of applications in building and industry is covered in 8-pp Bulletin AT-116B. Selection data for air tools and a trouble chart are included. Le Roi Div., Westinghouse Air Brake Co.

415 Welding Positioners—Illustrated and described in 16-pp Bulletin P-28 is a line of welding positioners ranging from 3000 to 100,000 lb capacity. Features and advantages

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DATA FILE

(Begins on page 242)

are detailed, and dimensional diagrams, and load tables included. Harnischfeger Corp.

416 Masonry Bits—Catalog M B C-56 describes carbide-tipped masonry bits for drilling holes in tile, brick, concrete, granite or any other kind of masonry. Specifications are included, as well as a table giving chuck and shank requirements to adapt to different electric or pnematic hammers. New England Carbide Tool Co., Inc.

417 Powder Actuated System—Two booklets cover applications of a powder actuated fastening system. One booklet shows how it can be used for plant maintenance—fastening conduits, bus ducts, junction and outlet boxes, surface raceways, fixtures and frames, etc. The second booklet indicates the correct fastening and charge to use. Ramset Div., Olin Mathieson Chemical Corp.

418 Power Tools—Comprehensive information on power tools for industrial production, plant maintenance, construction, wood and metalworking is presented in the 58-pp edition of their 1959 product guide. Specification and applications data on such items as power saws and saw blades, sanders, grinders, brushes, drills, files, grinding wheels, screwdrivers included. Skil Corp.

419 Hydraulic Power Tools—Bulletin A-5-58 covers independent pump hydraulic jacks, single and double plunger hand pumps and double acting air engine pumps. Advantages are detailed. H. K. Porter Co., Inc

420 Shop Equipment—Work benches, tool stands, shelving and other pressed steel equipment for the shop, laboratory and assembly line are shown in 8-pp Form 2299. Construction features and specifications of size, top material, equipment variations. Standard Pressed Steel Co.

Postage-free cards for ordering catalogs are on page 237. You may also use the cards to order literature mentioned in the ads.

421 Heavy Duty Soluble Oil—Described in Booklet SP-9089 is a heavy duty soluble oil designed for use on tough cutting and grinding operations. Advantages are listed. Gulf Oil Corp.

422 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44-pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. Coversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

CONSTRUCTION

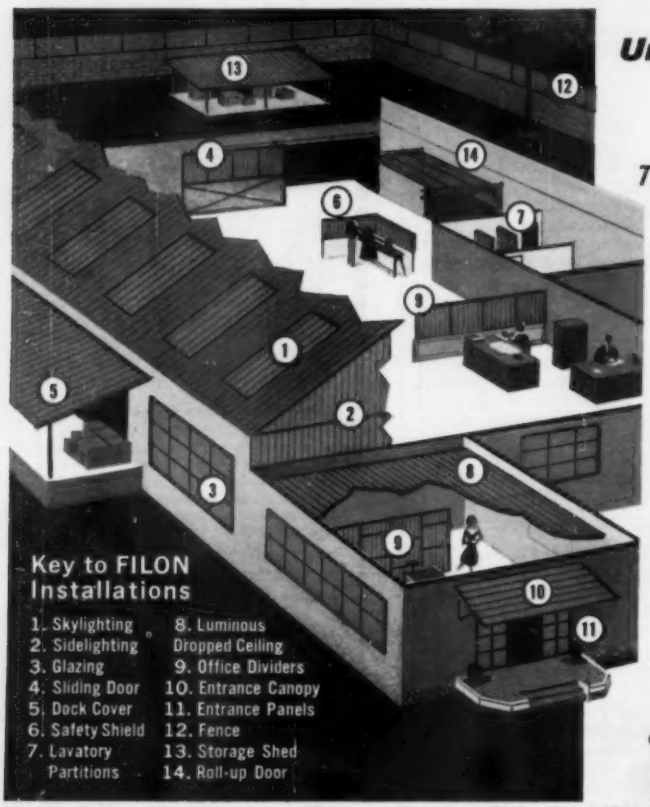
423 Foundation Pipe Piles—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in 24-pp Form F-5677. In addition to detailed specifications, the illustrated booklet describes a number of pipe-pile installations and includes driving logs. L. B. Foster Co.

424 Insulating Panel—Application information and design data for Asbestone insulating panels are presented in 28-pp Manual, File 19-D. Covers construction and characteristics of panels, exterior curtain wall applications, interior applications, painting and decorating panels, and detailed specifications. National Gypsum Co.

425 Fiber Glass Panel—Technical data and installation procedures for fiber glass reinforced plastic glazing panes are presented in this illustrated Brochure 137. Outlines product's mechanical and physical properties and heat transmission. Filon Plastics Corp.

426 Fir Plywood—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Assn.

427 Replacement Glazing—Twelve-pp Booklet PL-251 gives detailed information on glazing industrial and other buildings with flat panels of



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the acrylic plastic, Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems, this practical booklet gives properties of this sheet. Plastic Dept., Rohm & Haas Co.

428 Aluminum in Colors—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet products, a complete line of sheet products offered in 11 colors. Aluminum Co. of America.

429 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet AL-29, 8-pp. Discusses safety features. Alan Wood Steel Co.

430 Resilient Floors—Properties and characteristics of resilient flooring are covered in comprehensive 52-pp Catalog File 23-G. Offers a guide to basic types of vinyl flooring materials, characteristics, gauges of resilient flooring, and other technical data, and includes methods and techniques of installation and detailed specifications. Armstrong Cork Co.

431 Grating, Stair Treads—Bulletin 1105, 16-pp, describes construction and design advantages of company's line of interlocked grating and stair treads. Contains detailed information, photos, drawings and engineering data on rectangular, diagonal, radial and serrated gratings, stair treads, armoring. Dravo Corp.

432 Steel Grating—Featured in 16-pp Bulletin 14R are company's steel grating and stair treads for a variety of industrial applications. Pictures of typical installations are included, also tables of engineering data. Kerrigan Iron Works, Inc.

433 Cold Storage Doors—Power operated and hand operated cold storage doors are illustrated and

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DATA FILE

(Begins on page 242)

described in Catalog 259. Door construction features are detailed, and installation and specification data furnished. Clark Door Co., Inc.

434 **Wire Mesh Partitions**—Advantages of company's wire mesh partitions for closing off restricted areas are told in this product bulletin. Specifications are included, as well as photos. Phoenix Wire Works, Inc.

SLINGS, CHAINS, WIRE ROPE AND FITTINGS

435 **Wire Rope Data**—Characteristics of wire rope and its care and maintenance are covered in an interesting series of product bulletins—Bulletins 101-107. The bulletins cover abrasion, crushing, storage and lubrication, inspection, bending fatigue, localized wear, and selection data. Leschen Wire Rope Div., H. K. Porter Co., Inc.

436 **Sling Handbook**—Form SL-3 is an illustrated 40-pp reference book covering more than 80 subjects on slings and fittings. Included in this revised edition is reference information condensed into handy chart form on sling types, dimensions, loads. Union Wire Rope Corp.

437 **Sling Chain Handbook**—Illustrated Data Book 100. 32-pp, presents "how to do it" information on sling chains —from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of the sling chains. Columbus McKinnon Chain Corp.

438 **Slings for Industry**—Bulletins 5886 and 5308-R describe Safe-Guard cable-laid slings, designed for applications where a soft sling body is required and where flexibility is more important than resistance to abrasion; and rope-laid slings for applications where abrasion resistance is a must. Macwhyte Wire Rope Co.

439 **Drop Forged Fittings**—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Also announces range of sizes and capacities in many of items listed, as well as new products, including clips. Crosby-Laughlin Div., American Hoist and Derrick Co.

DUST, FUME CONTROLS

440 **Dust, Fume Control**—A wide range of industrial dust and fume producing processes that can be successfully controlled with the properly designed cloth or glass bag-type dust collectors is covered in 24-pp Bulletin 562-D. Operating principles shown. Wheelbrator Corp.

441 **Industrial Dust Control**—A wide variety of collection methods for industrial dust control is described in 16-pp Bulletin 922. A typical case history is included as well as photos, cutaway views, drawings and capacity data. Pangborn Corp.

442 **Dust Control Systems**—Bulletin 104, 36-pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information, capacities and dimensions for other dust filters. The W. W. Sly Mfg. Co.

443 **For Dust Collection**—A collection of product sheets providing application suggestions and specifications on Dustkop equipment designed to solve a wide range of dust handling problems is provided in the Series 700 bulletins. Various models are described. Aget Mfg. Co.

444 **Cloth Dust Collector**—Advantages and features of company's cloth dust collector which imparts a centrifugal action to dust entering collector and reduces loading of the cloth are detailed in Bulletin 10-27-59. Sectional view showing operating principles is included, as well as dimensional data and specifications. Dustex Corp.

445 **Dust Collectors**—Self-contained cabinet cloth-filter type dust collectors are illustrated and described in this 6-pp Bulletin 359. Design details and dimensional data included. Torit Mfg. Co.

INSTRUMENTS AND CONTROLS

446 **Precision Instruments**—Catalog G1 contains 32-pp of comprehensive information on indicating, recording and controlling instruments. Contains potentiometers, pyrometer supplies, descriptive and illustrative data on systems and components, null indicators, amplifiers and oscillographs, pressure gages, flow and liquid level meters, pneumatic remote transmission, thermometers, panelboards, valves, diaphragm motors, motor and dampers, switches, etc. Minneapolis-Honeywell Regulator Co.

447 **Controls for Automation**—Automation Controls Catalog, 44-pp, groups together a wide selection of automatic controls most commonly used in designing automatic systems. Includes such items as counting devices, switches, electric valves, actuators, relays, limit controls, time switches and accessory equipment which can be used as building blocks in selecting components for tailoring system. General Controls Co.

448 **Automatic Controls**—Catalog 26 comprises 52 pages which describe and illustrate electric thermostats, pressure controls, humidistats, motor-operated valves, temperature regulators, motor operators, unit ventilator controls, hot water controls, electronic controls, control centers and accessories. Operational and application data is incorporated with the descriptions. Barber-Coleman Co.

449 **For Limited Panel Space**—Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a small space, has a scale 20 in. long. The Liquidometer Co.

450 **Meters, Regulators, Valves**—Bulletin C-5000, 28-pp, describes and illustrates meters, regulators and valves for a wide range of services. They include gas meters, gas pressure regulators, industrial meters, water meters. Information includes application suggestions, specifications and references to more detailed product literature. Rockwell Mfg. Co.

451 **Gages, Needle Valves**—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. Marsh Instrument Co.

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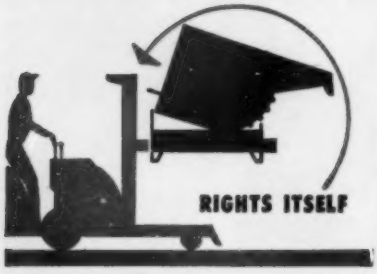

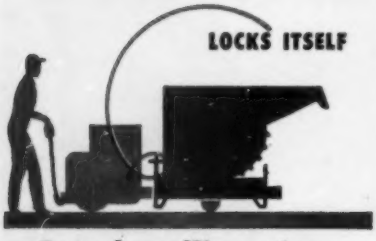

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DATA FILE

(Begins on page 242)

452 Liquid Level Indicators—Bulletin RI-1825 contains 24-pp of detailed information on a remote indicator for boiler water levels, its temperature compensating unit and pressure compensator accessory mechanisms, an associated automatic control unit for operating indicator. Covers advantages, details of operation. Yarnall-Waring Co.

453 Pilot Positioner—Advantages of company's pilot positioner which combines in a single instrument the operations of an indicating pneumatic controller and a valve positioner are detailed in this product bulletin. Operating principle is fully illustrated and explained. United States Gauge, Div. American Machine and Metals, Inc.

454 Stroboscope Data—Applications of the electronic stroboscope are illustrated and described in 8-pp Form 766-D. Includes complete descriptive and specification data on the Strobotac—a small, portable stroboscope tachometer—as well as on the Strobolux, the Strobolume and the Microflash. General Radio Co.

455 Burner Control Systems—Folder 5803-A describes pre-wired, panel control systems for automatic oil, gas or dual-fuel burners in industrial and other boiler installations. Included are dimensions, illustrations, selection chart for ready identification of panel assemblies. Iron Fireman Mfg. Co.

FANS, VENTILATING, AND AIR CONDITIONING

456 Mechanical Draft Fans—Eight-pp Catalog 1361 describes centrifugal fans designed for handling abrasive gases at elevated temperatures. Comphysical data are given, as well as a list of optional accessories. Sturtevant Div., Westinghouse Electric Corp.

457 Industrial Fans—Bulletin 690-A, 12-pp, contains dimensions and application and performance data on direct connected fans for general and system ventilation and power roof ventilators with air deliveries to 103,200 cfm. Design features and typical installations illustrated. Propellair Div., Robbins & Myers, Inc.

458 Power Exhausters—Bulletin 58-B contains 12-pp of detailed information on company's line of power exhausters. Construction features are illustrated and described, and performance and dimensional tables are included. Cutaway views and drawings show internal construction features. Jenn-Air Products Co., Inc.

459 Air Engineering—Bulletin E-57 is a 24-pp air engineering data file covering engineering and test facilities for propeller fans, specifications,

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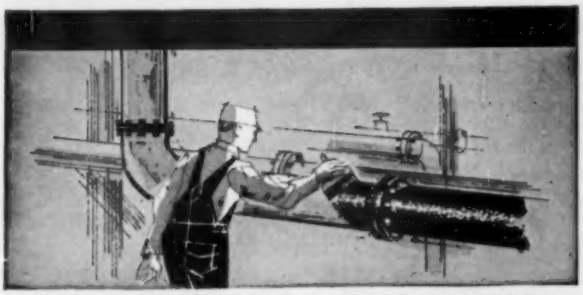

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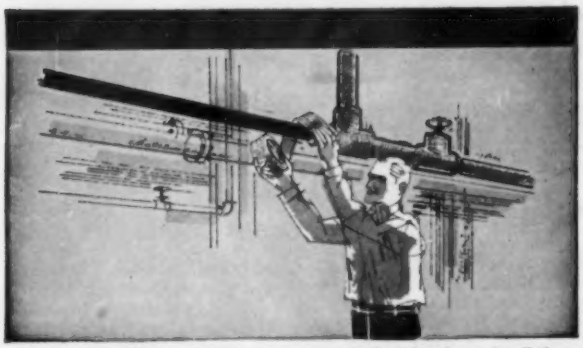

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An easy-to-use, wrap-around pipe covering, perfectly pliable, cork-filled, completely self-adhering. Forms an air-tight, 100% vapor- and moisture-proof jacket. Fits snugly even around tees, unions, angles, valves. Cuts maintenance costs—makes out-of-the-way storage areas useable—ends slip and slide floor hazards. No need for vapor seals, brads, fasteners or tools of any kind.

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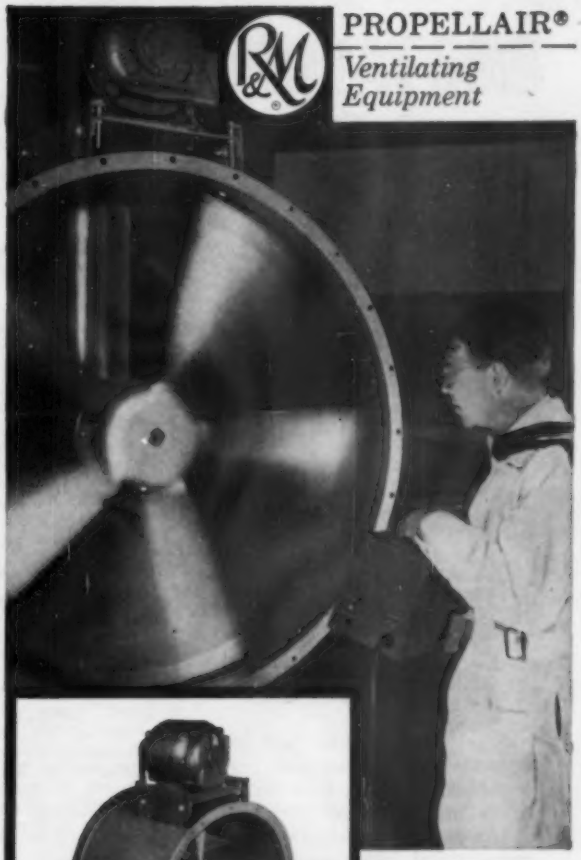

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Move corrosive or explosive fumes, extreme heat or high humidity with new PROPELLAIR Type BT belt driven axial fans. They feature heavy 10 and 12-gage drums . . . isolated, air-cooled, protected bearings and belts . . . airfoil propellers cast of hi-strength aluminum-magnesium alloy . . . Robbins & Myers *"All-Weather"* motors for a single nameplate guarantee on the complete unit.

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Send today for complete information on this modern, efficient fan. Ask for Bulletin 620—PE

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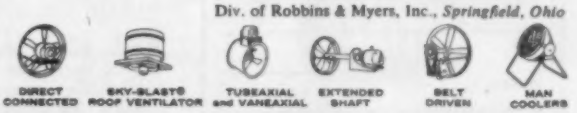

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DATA FILE

(Begins on page 242)

construction, maintenance, and installation. Tables for estimating air-handling requirements are provided. Aerovent Fan Co., Inc.

460 Ready Units—Catalog 517 provides 36-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, belt and direct driven units. Dimensions included. Clarage Fan Co.

461 Zone Control Cabinets—Air conditioning zone control cabinets are described and illustrated in 20-pp Bulletin AC-220. Separate sections with tables, curves and sketches cover proper unit selection, physical data, dimensions, fan performance and coil ratings for water cooling, direct expansion, hot water and steam. Buffalo Forge Co.

462 Air Conditioning Units—Bulletin 786 contains 54-pp of selection data on air conditioners, including capacities, standard arrangements, dimensions, etc. Steps in selection of basic unit and components are outlined. First pages are devoted to choosing the physical size based on air capacity and face velocity requirements, while succeeding pages concern themselves with heating and cooling requirements, control. American Air Filter Co., Inc.

FILTERING

463 Filter Media Selection—Twelve-pp Bulletin PUR-66D contains a chart designed to guide selection of proper engineering materials and filter media for given types of corrosive conditions. The chart lists filter media for varying concentrations of more than 125 corrosive agents. Purolator Products, Inc.

464 Filters for Industry—Illustrated and described in this product bulletin are filters for a variety of applications in industry. Among those covered are liquid filters, intake filters, pipe line filters, dry and viscous panel filters, precipitators, Electro-Staynew mist collector, and a dual action filter. The Dollinger Corp.

BOILERS AND GENERATORS

465 Automatic Boilers—Powermaster Model 3 packaged automatic boilers are described and illustrated in 12-pp Bulletin 1260. Boiler types, including gas, oil and combination gas-oil models, a specially-designed hot water boiler, and steam atomizing principle for use with No. 6 oil are included. Ratings and dimensions of all sizes given, as well as details of burners. Orr & Sembower, Inc.

466 Boiler Construction—Bulletin BE100 describes advantages of practical boiler construction with 2 pass design, featuring comparable results with equal heating surface, but with Continental's two-pass features—turbulent spinning gas technique-uniform heating, no refractory baffles and symmetry of furnace layout. Boiler Engineering & Supply Co.

467 Steam Generators—Advantages of company's steam generators designed to adjust to actual production needs are detailed in this 6-pp Product Bulletin C-731. Schematic diagram showing operating details is included. Clayton Mfg. Co.

468 Steam Generators—Design and construction details on a packaged unit steam generator are presented in 10-pp Bulletin PSG-3. Fabrication procedures are illustrated and capacities, dimensions and weights tabulated. Henry Vogt Machine Co.

SAFETY, SANITATION

469 Engineered Maintenance—This 16-pp booklet tells how to control costs, improve efficiency and save management time in sanitary maintenance. Tells what an engineered maintenance program includes, how it is prepared, advantages afforded. Puritan Chemical Co.

470 Special Fire Protection—Devoted to special hazard fire protection, this 44-pp booklet covers both equipment and methods. Tells how to recognize special fire-hazardous conditions in a plant. Discusses in detail major types of fire protection, telling how each functions, giving its advantages and limitations, and illustrating some examples of successful use. Two features of interest are a disscusion of fire itself and an at-a-glance selector chart. Grinnell Co., Inc.

471 Testing Skin Cleansers—The use of radioactive material to check the cleansing efficiency of various materials and formulas used in production of skin cleansers by this manufacturer is described in this brochure. Basic steps in test shown. The Sugar Beet Products Co.

OTHER EQUIPMENT

472 Classifying Systems—This bulletin covers major advantages, industrial applications and design features of high efficiency classifying systems for efficient separation or dedusting of dry powdered materials. Includes details on operation, flexibility or arrangement, power requirements, construction. Buell Engineering Co., Inc.

473 Water-Cooled Stoker—Design and operating advantages of the Vibra-grate Stoker are outlined in this illustrated bulletin. A large cutaway view details component parts of the stoker. American Engineering Co.

474 Industrial Finishing Equipment—Catalog A659, 12-pp, describes modern finishing system for cleaning, rust proofing, drying, painting and finish baking. The R. C. Mahon Co.

475 Production Control System—Versatility of company's visible record systems in production control is illustrated and described in this 12-pp Bulletin SB-66. How various types

NEW AXIAL ROOF VENTILATORS BY WESTERN

The Westernaire®
Low Silhouette Hooded
Exhaust Ventilator

The Westernaire®
Low Silhouette Vertical
Exhaust Ventilator

Above: A high efficiency power unit in a low, weather-proof housing. For both commercial and industrial use. 360 degree near horizontal discharge. Aerodynamically correct spun housing. Heavy guage steel, aluminum or non-corrosive Fiberglas* construction.

Low silhouette high efficiency power roof ventilators for vertical or horizontal air discharge provide motor mounting below the venturi to achieve styling compatible with modern architecture plus a smooth airstream discharge pattern.

Above: High capacity power unit specifically designed for industrial usage. Fumes, smoke, dust-laden and foul air projected high above roof to prevent re-entry into building. "Blow-open" dampers rest on neoprene seal. Completely weatherproof.

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Cleans everything . . . economically

A new, "use it everywhere" liquid detergent—Oakite 202—now offers the greatest convenience EVER in cleaning. It goes into water solution quickly—without waste. You spray, mop or brush it on.

Oakite 202 forms a rich, sudsy solution that's charged with cleaning power. It cuts through grease, oil and grime. It's perfect for cleaning cement or wood floors. It brightens painted walls, woodwork, equipment.

Best of all—Oakite 202 in mild solutions outperforms strong solutions of other cleaners. This makes it a most economical all-purpose material.

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OAKITE SCIENCE

50 years leadership in industrial cleaning

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DATA FILE

(Begins on page 242)

of visible record forms guide decisions—from sales records and market analysis, through engineering design, purchasing, cost, tool and die, shop parts and materials stores, production and scheduling—is pictorially presented. Acme Visible Record, Inc.

476 High Velocity Equipment—High velocity valve attenuators are described in 24-pp Bulletin K33-A. Technical and factual information on sound control, duct design methods, and proper selection of units is given, and comprehensive graphs, diagrams, and charts are provided. Separate scale drawings and photos of each of five models, showing contiguous construction, included. Connor Engineering Corp.

477 Chain Link Fence—Catalog F-915, 64-pp, contains illustrated information on company's line of chain link fences of aluminum or steel for a variety of industrial, commercial and other applications. Detailed specifications and dimensional data are included, as well as photos of typical installation. The Colorado Fuel and Iron Corp.

478 Coagulant Aids—Featured in this product bulletin is a line of coagulant aids designed to improve floc formation in clarifying and softening water. Advantages are detailed. Calgon Co., Div., Hagan Chemicals & Controls, Inc.

479 Industrial Stack—Detailed information on a permanent, low cost refractory smoke stack for commercial and industrial applications is contained in 8-pp Bulletin IS-32. Gives product information, applications with boilers, furnaces, etc. Van-Packer Co., Div., The Flinkote Co.

480 Fluid Mixers—Advantages and mechanical features of company's industrial mixers designed for a variety of fluid mixing operations are detailed in a series of bulletins available in this ring-bound notebook, containing Bulletins B-102, 103, 104, 108 and 111. Selection tables, outline dimensions and photos of typical applications are included, as well as specifications, mixer capacity tables, photos. Mixing Equipment Co., Inc.

Postage-free cards for ordering catalogs are on page 237. You may also use the cards to order literature mentioned in the ads

481 Consulting Service—Advantages of company's consulting service are detailed in 8-pp Bulletin 5006-A. How the service is qualified to solve problems concerning scale and corrosion control in boilers, cooling systems, and process waters is discussed. Dearborn Chemical Co.

482 Laboratory Supplies—This 12-pp price list announces the latest prices for a wide range of laboratory supply items, including water analysis sets, conductivity equipment, colorimetric comparators, laboratory glassware and supplies, chemical reagents. Betz Laboratories, Inc.

483 Drain, Supply Line Cleaner—Described in Bulletin 658Du is a drain and supply line cleaner featuring a lightweight aluminum alloy housing. Features and advantages are illustrated and described. Kollmann Mfg. Co.

484 Industrial Cooling Towers—Design and construction features of company's industrial cooling towers utilizing the cross-flow principle are detailed in Bulletin G-60. Also described are double-flow aquatowers, and other equipment. The Marley Co.

485 Acoustic Booth—Descriptive information on the Hush-A-Booth, a wall-mounting type acoustic chamber for telephones and intercom equipment, is presented in Bulletin K9A. The Korfund Co., Inc.

486 Metal Surface Treatment—This 40-pp catalog on metal surface processing (cleaning, washing, rinsing, drying, and spraying, flow and dip coating) illustrates and describes

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...cleaned by **WHEELABRATOR**® air filters

Your investment in steel making equipment is too big to take a chance on motor failure resulting from dust in the atmosphere. Especially when Wheelabrator Ultra-Filtration air filters can provide essential air purity at minimum cost.

In prominent American and Canadian steel plants, Ultra-Filtration today is providing over 5,000,000 cfm of super-clean air for motor rooms, control rooms, electrical equipment and turbo blowers.

The low cost of operating Wheelabrator Ultra-Filtration air filters is gratifying, too. No liquids, oils or tacky materials are involved — there is no problem of sludge removal. In one typical installation, *absolutely* no maintenance cost has been experienced in filtering over 394,000,000,000 cf of air.

Ultra-Filtration provides any degree of air purity you require, at minimum cost

Ultra-Filtration delivers collection efficiencies above 99% by weight and 95% by blackness test, even when filtering sub-micron size particles. For illustrations of highly efficient Dustube installations, write for Catalog 562-D. Wheelabrator Corp., 859 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ont.

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Now, with more than fifty models in the Dustkop line—plus efficient accessory items—the odds are that a standard unit will solve your problem. Dustkop units solve other problems too. They're easier to install, save space and money and are virtually maintenance-free!

how to select a dust collector

This new brochure includes all basic information needed to select the right dust or mist collector for grinding, buffing, polishing and other types of service. Write for your copy. No obligation.

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1388 Church St., Adrian, Michigan

DUSTKOP STOPS DUST

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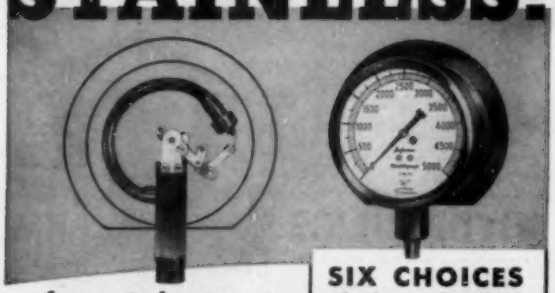

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Now the superlative Mastergauge is available in a wider range of corrosion resistant tubes and sockets than any other pressure gauge.

Check the adjoining list. And remember that tube socket and tip are fused into one piece by the exclusive Marsh "Conoweld" process.

Marsh alone combines the "Conoweld" construction, the copper-clad "Marshalloy" case, the finer Mastergauge movement, the Marsh "Recalibrator", the new "Safecase." Ask for data covering your specific needs.

SIX CHOICES
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4130 alloy steel tube with alloy steel tip and socket.

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Time-Saving, Slide-to-Size ⅛" to 2⅜" O.D. Capacity

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Protected Feed Screw
Always Easy-Turning
⅛" to 1⅛" O.D. Capacity

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RIDGID
The Ridge Tool Company • Elyria, Ohio, U.S.A.

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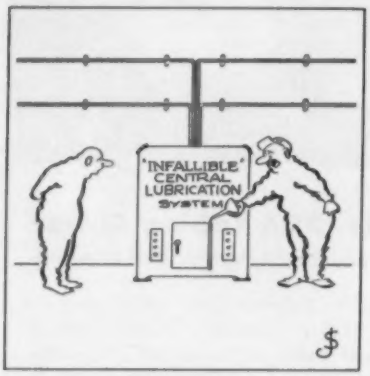
DATA FILE

(Begins on page 242)

drum-type machines, conveyor machines and systems, combination drum and conveyor machines, monorail machines, complete automatic finishing systems, and barrel finishing equipment. Design features, components and accessories are covered. Ransohoff Co.

487 **Rotary Air Motors**—Catalog 859, 8-pp, describes a line of rotary air motors, compressors, and vacuum pumps designed to give continuous air motor power or delivery. Includes dimensional diagrams, speed-hp-air consumption curves, pressure and vacuum curves, and other data. Gast Mfg. Corp.



"Hinge squeaks."

488 **Packaged Liquid Cooler**—Sixteen-pp Bulletin HB-459 describes a water chilling unit for use in space cooling systems, combination heating and cooling systems and for industrial processes requiring controlled cooling of materials. Schematic diagrams of typical systems are included, as well as wiring diagrams and other data. Bell & Gossett Co.

489 **Pneumatic Products**—Catalog 616E contains 22-pp of comprehensive information on company's pneumatic products, including filters, regulators, lubricators, combination units, air relief valves, air strainers and accessories. Specifications are given, as well as curves showing performance characteristics. Watts Regulator Co.

490 **Cyclone Separators**—Featured in 8-pp Bulletin 712 are company's cyclone separators and pipe line after-coolers designed to provide cool, dry and clean compressed air and gases. Cutaway views illustrate component parts and features, and capacity tables facilitate selection. R. P. Adams Co., Inc.

491 **Magnetic Equipment**—Product and application information on a line of magnetic separators, magnet automation units, and vibratory equipment is presented in 47-pp pocket-size Booklet B-575. Descriptive information and photos of typical installations. Eriez Mfg. Co.

492 **Automatic Air Products**—Featured in 22-pp Bulletin 157 are automatic air products, including separators, afterdriers, filterators, filters, line drains, governors and kits, combinations, regulators, and lubricators. Advantages are detailed and operation described. Wilkerson Corp.

493 **Aluminum Coated Wires**—Described in 6-pp Folder DH-537B are aluminized steel wire and wire products, including steel core wires, steel strand guy wire, overhead ground wire, toe wire, messenger wire, telephone wire, chain link fabric and barbed wire. Properties and applications listed. Page Steel & Wire Div., American Chain & Cable Co., Inc.

494 **Elastomer Coated Fabrics**—Detailed information on synthetic elastomer coated fabrics is presented in this 12-pp bulletin. Physical properties and tests of the various synthetic fabrics, applications and specifications are covered. E. I. du Pont de Nemours & Co., Inc.

495 **TV at Work**—This 8-pp brochure, "How Many Jobs," covers an extensive line of industrial television equipment. Shows cameras, control units, monitors, accessories, and projection systems. Varied applications, including installations with unusual engineering requirements are pictured. General Precision Laboratory.

FILTER TIPS

New design information on Purolator Micronic® filters

This new, free bulletin gives the plant engineer complete basic data on Purolator's phenolic resin impregnated, cellulose filter elements. Micronic elements pack maximum filter area into minimum space (up to ten times more than other types); do not channel; are waterproof and warp-proof; have rigidly controlled porosity.

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The P192 Purolator Micronic Filter Series is a line of small, full-flow industrial filters for general lube work and for hydraulic systems up to 1,000 pounds. Features include:

- The Micronic® Filter element...resin impregnated cellulose, preformed and pleated for greater filtering area. (10 times that of any other.)
- Relief valves and corrosion-resistant parts, where needed.
- Handy, easy-to-use replacement element package.
- Mounting brackets on all filters.

Send for details and data, or write us the particulars of your problem. We'll be glad to help. Write Dept. P11-22.

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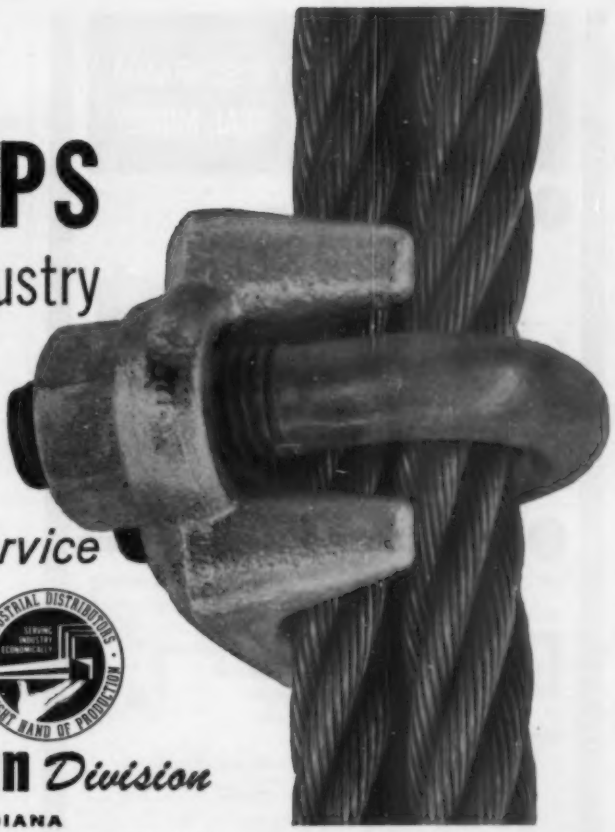

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Oil-free air blast with carbon-vane

GAST ROTARY AIR PUMPS

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Built in six smaller sizes, some with integral motors — 1/12 to ½ h.p.

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Need compressed air that's *absolutely free* of oil mist? A Gast Oil-less Air Pump may be your answer! Air flow *can't* contain oil vapor, because no oil is used.

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Four carbon vanes lubricate themselves. Ball bearings are grease-sealed for life and separated from pump chamber by a ventilated space. Built in 7 models.

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"Air may be your answer!"

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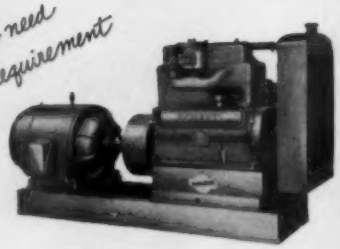
everything you need for any air requirement in one unit!



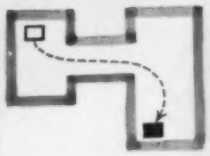
2 they're compact

go anywhere in minimum space

in odd corners

overhead

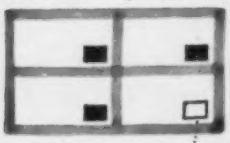
3 they're easy to move



transfer anytime to meet changing needs

4 they fit a unit system

buy only the Schramm compressors you need



add units as you expand

5 they need no elaborate foundation

just put a Schramm in any floor space

save cost of reinforcing the floor

6 they have no vibration

buildings and floors don't shake all day

you don't even have to bolt a Schramm to the floor

Schramm Stationary Compressors are electric motor or V-belt driven . . . 50 to 600 cfm. Write today for copy of Bulletin SSB-59.

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Portable — versatile — economical. Simplest, quickest way to clean motors, machinery and other equipment. Pays for itself in any plant. Ask your dealer for a demonstration.

4 BLOWER-SUCTION MODELS

...including powerful Model HP with 2-speed motor for double duty. Easy starting at low speeds prevents blowing of fuses. All models available with attachments for handling many special tasks.

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Blows dust, grit, chips and filings from hard-to-reach places. Use it as a suction cleaner for all kinds of jobs, or even to salvage bits of rare metal. Other models for annealing, soldering, and for preheating for bending.

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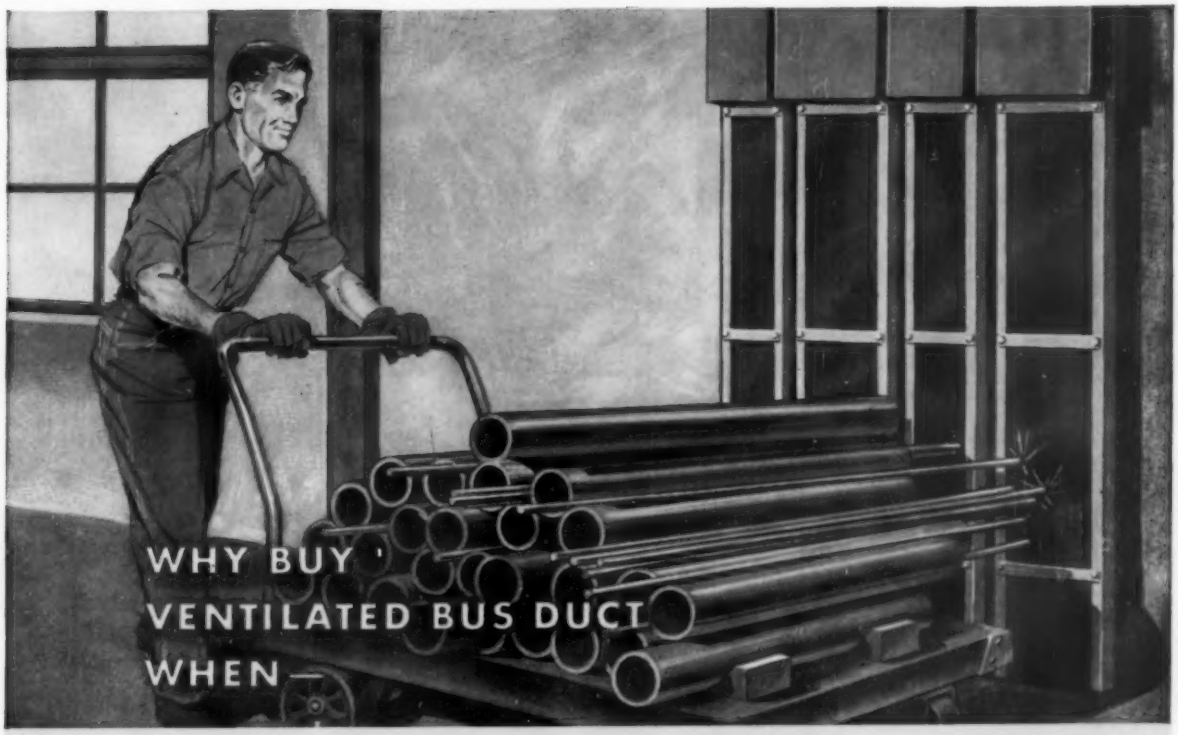


Square D TOTALLY ENCLOSED Duct* is SAFER—*and costs no more*

*(low impedance)

• Ventilated bus duct may be as vulnerable as it looks. In fact, Paragraph 3644 of the National Electrical Code prohibits its use in certain areas by specifying:

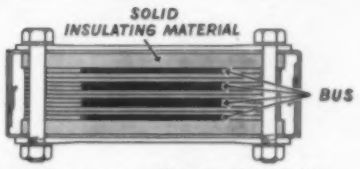
> **"Busways may extend vertically through dry floors if totally enclosed (unventilated) where passing through and for a minimum distance of six feet above the floor to provide adequate protection from mechanical injury."**

All Square D low-impedance duct is totally enclosed! It has no ventilation holes open to falling objects or dust. It's smaller than ordinary ventilated bus duct. It mounts in any position without de-rating. Doesn't it make sense, when buying low-impedance duct, to specify a product that's safer? Square D totally enclosed low-impedance duct costs no more—why settle for less!

Here's Why Square D's

EXCLUSIVE Design

makes ventilation unnecessary



The entire space within the duct and between the bus bars is filled with a solid insulating material which conducts the heat to the surface. There are no dead air spaces inside the duct. Square D totally enclosed low-impedance duct is listed with Underwriters' Laboratories and meets U/L requirements for temperature rise in any mounting position.

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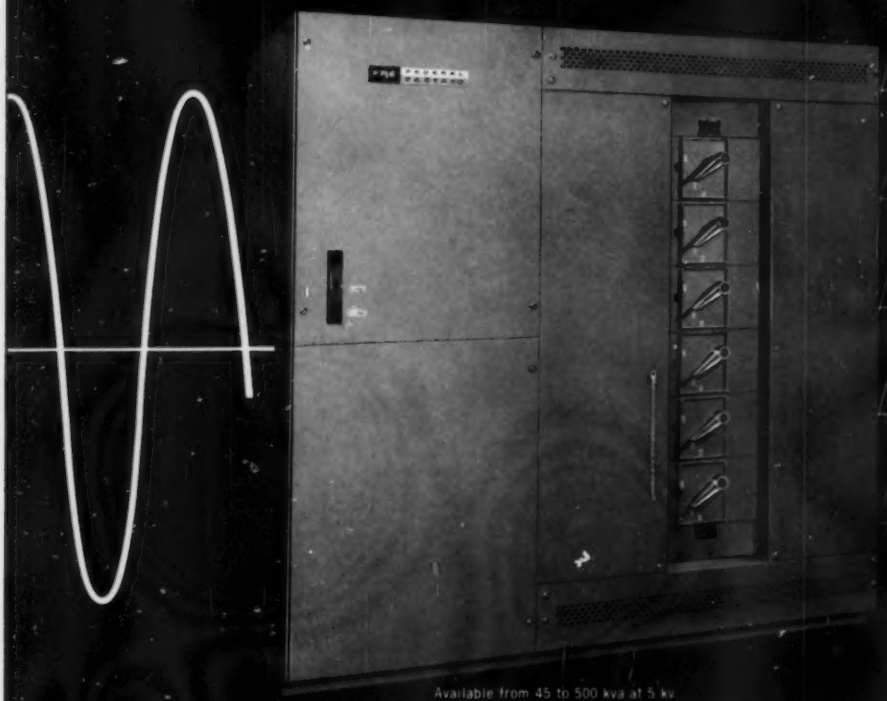

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From 45 to 300 kva at 15 kv.

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give you Power on demand—Where and When you Need it

These compact, factory assembled power centers let you take advantage of economical primary power rates, lower installation costs, and reduced voltage drop on your distribution system.

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DISTRIBUTION SECTION—**Rotary Handle Circuit Breakers through 800 a.—QMQB Fusible Switches through 1200 a....meet your distribution requirements.**

Plus all these features:

COMPACT SIZE **Up to 50% more kva per square foot of floor space. Typical 500 kva unit is only 78" high, 77" long, 42" deep.**

FASTER INSTALLATION **Only one pre-engineered, factory-assembled unit to handle.**

SIMPLIFIED MAINTENANCE **All operating parts accessible from the front.**

DESIGNED FOR SAFETY **All high voltage parts including rotary tap changers are mounted in an interlocked compartment.**

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